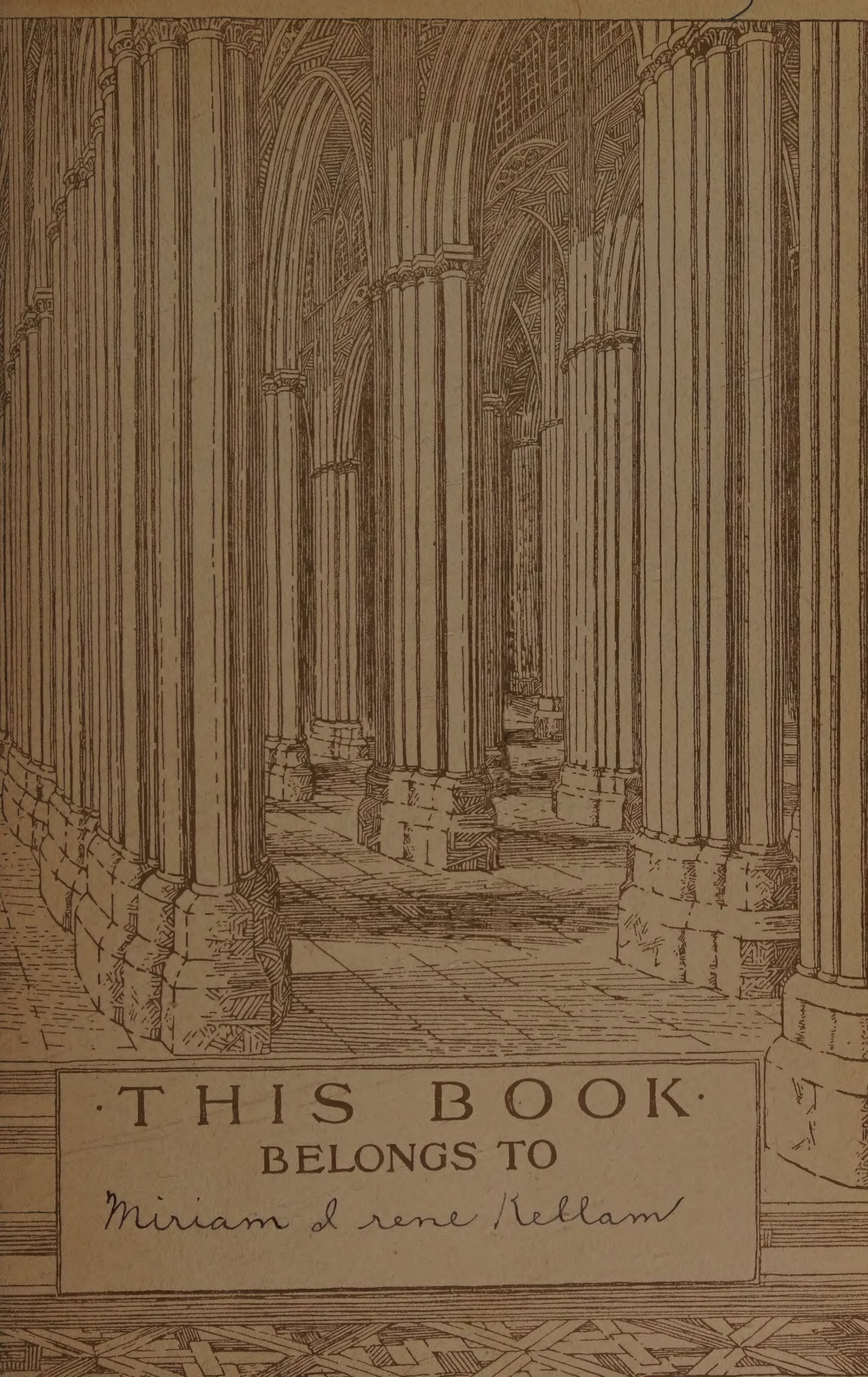
Seymour Jones



·THIS BOOK·
BELONGS TO
Miriam Irene Kellam

THE NEW

STUDENT'S REFERENCE WORK

FOR

TEACHERS, STUDENTS AND FAMILIES

EDITED BY
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THE STUDENT'S CYCLOPAEDIA

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D

D (*dē*), the fourth letter, is a vocal consonant. It is classed as a dental or hard palate sonant, because made by the point of the tongue against that palate or the front teeth, as in *day*, *fixedness*, *old*. When preceded by a surd in the same syllable, *d* sounds as *t*, as in *arched*, *hissed*, *looked*. It is silent in *handkerchief*, *handsome*, *windrow* and the first syllable of *Wednesday*. The Romans used D as a numeral (500) as well as a letter.

Dacca (*dăk'ȧ*), a city of Bengal proper, 150 miles northeast of Calcutta, on the north bank of the Buriganga. It occupies an area of eight square miles, and consists of a dull esplanade and one long street meeting at right angles, with a network of narrow, crooked lanes. It, however, has unusual advantages for inland navigation, as its position commands the principal waterways of the delta. About 1610 it became the seat of the Mohammedan government of Bengal, which rank it kept, with a short break, until 1704. In the 18th century it became celebrated for its muslins, and the English, French and Dutch had manufactures here. It has since declined (the population falling off from 200,000 in 1800 to 69,212 in 1872), until the last few years have revived its prosperity. Besides manufactures, Dacca has a college and good schools. The Dacca and Maimansingh state-railroad, opened in 1886, has helped its growth. Population, 85,000. Dacca also is a district in Bengal, watered by the Brahmaputra. Its population is close upon 10,000,000.

Dacia (*dā'shĭ-ȧ*), an ancient country of Europe, of uncertain limits, lying north of the Danube and south of the Carpathian Mountains. It comprised at least what now is the eastern part of Hungary, Transylvania, Moldavia and Wallachia. It was inhabited by an exceedingly warlike people of German origin, who held the Romans in check from 10 B. C. until 100 A. D. During the reign of Domitian the Romans were even obliged to pay tribute. In 106 A. D. Trajan reduced the country to a Roman province. The Romans held most of this territory until 274 A. D., when Aurelian abandoned it to be overrun in succession by the Goths, Huns, Gepidæ, Avars and Scythians.

Dædalus (*dēd'a̤-lus*), in Greek fable, an Athenian who personified the beginning of the arts of sculpture and architecture. He killed his nephew and pupil, who envied his growing skill, and had to flee to Crete, where he carved the well-known cow for Queen Pasiphaë and designed the famous labyrinth for King Minos in which to confine the minotaur. He was imprisoned but escaped, forming wings for himself and his son Icarus, with which to fly across the sea. He flew safely across the Ægean, but Icarus flew too near the sun, the heat of which melted the wax that fastened his wings to him, so that he fell and was drowned in that part of the sea which the ancients afterward called Icarian. At Cumæ, in Italy, Dædalus dedicated his wings to Apollo. Many early works of art were ascribed to him. Discoveries in Crete have made it probable that Dædalus was a real person.

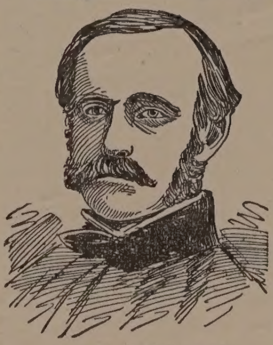
Daffodil. See Narcissus.

Dagobert (*dăg'ô-bẽrt*), the name of several of the Merovingian kings of France. The best known is Dagobert I, who ruled France from 628 to 638. He was a vigorous monarch, but debauched in his private life. His court almost equaled in magnificence that at Constantinople. His most noteworthy act was to revise and publish the old national statutes, known as the Salic and the Ripuarian laws.

Dagon (*dā'gŏn*), the national god of the Philistines, half-man and half-fish. He is mentioned in the Old Testament as having temples at Gaza and at Ashdod, and his worship probably existed in other parts of Palestine. It was at the temple of Dagon in Gaza that the Philistines offered a great sacrifice, when Samson, who had been delivered into their hands, was brought forth and pulled down the temple.

Daguerreotype. See Photography.

Dahlgren (*däl'grĕn*), **John Adolph,** an American naval officer, was born at Philadelphia in 1809, and died in 1870. He early entered the navy as midshipman, and soon rose in rank. While employed in the ordnance-department from 1847 to 1857, he made a series of experiments in the construction of heavy shell guns, which resulted in



ADMIRAL DAHLGREN

the adoption of a new pattern, called the Dahlgren gun. It is a muzzle-loading, cast-iron, smooth-bore gun, with great thickness of metal at the breech. Many of these guns are still in the United States service. Dahlgren also invented a rifled cannon for naval warfare. He did good service in the Civil War, being appointed rear-admiral and having command of the South Atlantic squadron. In 1869 he took command of the Washington navy yard, which he had held before the war.

Dahlia (*dăl′yȧ*). A genus of the composite family, containing some of the commonest garden-plants. All of the ordinary garden-forms are derived from a single variable species *D. variabilis.* The genus contains about ten species, which are mostly Mexican, a few occurring in Central and South America. As an illustration of the varieties which can be made from a single species, it may be said that over 3,000 different garden-varieties of *D. variabilis* have been named and published in catalogues.

Dahomey (*dă-hō′mā*), a French dependency since 1894 in western Africa on the upper Guinea coast, formerly a negro kingdom. It lies between the German colony of Togoland and the British territory of Lagos, and extends inland for about 130 miles. On the north it is bounded by the French military territory of the Niger. It is known to possess an area of 65,000 square miles, with 70 miles of seaboard. It is almost surrounded by hostile tribes, and the boundaries used to change with the king's changing fortunes in war. The main port is Whydah, from which a road extends to the capital, Abomey, a distance of 65 miles. Dense forests and dismal swamps cover about two thirds of this distance; then vast rolling plains rise for many miles in the direction of the Kong uplands. The Avon and Denham lagoons receive the rivers of the country, none of which, however, are important. Groves of oil-palms encircle each town, from which palm-oil is made in great quantities; while the rich soil yields all the wealth of tropical growth. Cotton-cloth is made, and weapons and tools are forged from native iron. The people are negroes, generally of small stature but robust and active. They are sociable, equally fond of dancing and of rum, but warlike and prone to theft. Fetish-worship prevails, the main gods being the snake-god, tree-gods, sea-gods and the thunder-gods. Human sacrifices are made to the sea-god. At Whydah is a temple to the snake-god, containing over a hundred sacred snakes. Annually, in October, are revived the grand "customs," when as many as 500 victims are sometimes sacrificed. The king, before his defeat by the French, was the most absolute of despots. Of his army of 10,000 soldiers, the best part consisted of Amazons, mighty and blood-thirsty women. Monster slave-hunts formerly occurred, but the slave-trade is now ruined. The Dahoman kingdom dated from the beginning of the 18th century, and reached the height of its power under Gezo, who reigned from 1818 to 1858. The seat of government is Porto Novo (19,000 inhabitants). Abomey, the old capital, about eight miles in circumference, has 15,000 people, and Whydah about 12,000. The population is estimated at 1,000,000. The imports amounted to $7,139,655 in 1910, and the exports to $3,576,470. Cottons, machinery, drink and tobacco were the principal imports; palm-nuts and palm-oil the leading exports. Income and outgo balanced in 1910 at 3,235,000 francs. An iron pier marks the port of Kotonu, about 125 miles of railway on the projected line to Chaoru being completed from that point, with a branch 20 miles long to Segborué and Whydah. Ultimately the line will reach the Niger. Another railroad is building along the Lagos frontier. Kotonu is connected with Abomey, the Niger and the Senegal by telegraph, 1,725 miles altogether, with 120 miles of telephone lines.

Dairy. See DAIRY-FACTORY, MILK and BUTTER.

Dairy=Factory. Dairying as a special business has been widely developed in America, during the latter half of the 19th century, through the use of the factory-system. The first factory was organized in New York in 1860; soon many others were started; and in 1866 in New York there were nearly 500 of them in operation, with a stock of cows worth over $10,000,000 and with farms covering about 1,000,000 acres. This industry soon spread over the country and into Canada, and was adopted in European countries as the American system of dairying. At first cheese alone was made, but soon butter was added; moreover, special factories for butter were introduced, called creameries. In the creamery the cream gathered from hundreds of cows is worked by one skillful butter-maker and commands a higher price than homemade butter. It is sent to great distances in cold-storage or refrigerator cars. Foreign buyers may have it on their tables within two weeks of churning. The dairy-interest has reached vast proportions in the United States and Canada; at least 1,500,000 farms, with 17,000,000 cows and 100,000,000 acres of land, are devoted to the various branches of the industry. In 1909 the milk-yield of the United States was 9,888 million pounds, while 311 million pounds of cheese and 627 million pounds of butter were produced.

Daisy, a familiar wild flower and member of the Composite family. Alice Dowd speaks of it as "one of the most successful flowers in the most successful of flower families." The farmer often calls it a weed, thinking wrathfully of its "success." The white rays of the White Daisy or White Weed attract insects, and in the closely-packed flowers that form the center the visitors find a feast that invites them to linger. It is also known as the Common Daisy, Ox-Eye Daisy, Love-Me, Love-Me-Not and Marguerite. The Daisy is the national flower of Italy. The name Daisy means Day's Eye, the English daisy closing with the close of day. This is a near relation of our white daisy, but has a pinkish tinge. It is the "wee, modest, crimson-tippit flower" of which Burns sang. Our Purple Daisy, the so-called Late Purple Aster, has a wide range, from Massachusetts to Minnesota and southward to the Gulf. The Blue Spring Daisy or Robin's Plantain flowers from April to June, is distributed east of the Mississippi, and prefers moist ground, grassy fields, hills and banks. The little Michaelmas Daisy bears a wealth of lovely feathery bloom, which may last to December. The Pig-Stye Daisy or Dog-Fennel is in ill-repute, as its name suggests; a rank weed, the unpleasant odor is repulsive to insects generally with the exception of flies, its chief fertilizers. From the western clover fields the ox-eye has even crossed the Atlantic, and in Europe found itself in high favor—no longer a weed, but given place in stately gardens.

Dakota River rises in the northeastern part of North Dakota, and flows south through South Dakota. It empties into the Missouri about eight miles below Yankton. Its length is estimated at 800 miles.

Dakotas (*dȧ-kō'tȧs*), a tribe of Indians residing between the Rocky Mountains and the Mississippi. Their language is thought to be nearer the Mongolian than that of any other Indian family. It is said that they came eastward from the Pacific till they met the Algonquins, and were held in check by them at the Mississippi. One tribe, the Winnebagoes, fought their way through to Lake Michigan. Another tribe, the Arkansas, settled on the Ohio, but were driven down the Mississippi to the region that now bears their name. The other tribes of the family are the Assiniboin or Stone Sioux, the Dakotas proper or Sioux, the Missouris, Omahas, Poncas, Iowas, Osages, Kansas, Ottoes, Minnetarees and Crows. It is now asserted that the Sioux followed the buffalo westward from the Atlantic across the Mississippi. There are some 30,000 Dakotas.

D'Alembert (*dȧ'lon'bêr*), **Jean le Rond,** a distinguished French mathematician and dynamicist, born in 1717, died in 1783. He was the illegitimate son of a French artillery general, Destouches, and of Mme. de Tencin. Left on the steps of a church in Paris, he was sent, not to a foundling asylum, but to a small town near Amiens. His father, returning from foreign lands, rescued the boy, took him to Paris, and educated him at the Mazarin College. It was at this institution that he assumed the name D'Alembert. At the age of 20 he settled to his life-work, the study of geometry and dynamics. He published an enormous number of papers; but his *Treatise on Dynamics*, which he completed at the age of 26, transcends all his other work in importance. The greatest advance which we owe to him is the introduction of a method (known as D'Alembert's principle) by which any of the complex problems of dynamics may be reduced to a corresponding problem of statics. By this simplification he obtained the solution of many otherwise insoluble problems. D'Alembert's *Dynamics* has been translated into German in volume 106 of Ostwald's *Classics of the Exact Sciences*, where it may be had at small cost.

Dalhousie (*dăl-hou'zĭ*), **James Andrew Broun-Ramsay, Marquis of,** was born at Midlothian, April 22, 1812. By the death of his elder brother he became Lord Ramsay, and on the death of his father he entered the house of peers as Earl of Dalhousie. He distinguished himself in Parliament, holding with credit many important posts, and in 1847 proceeded to India as the youngest governor-general ever appointed to that country. His course there was marked by energy and ability, and earned him the title of the greatest of Indian proconsuls. He carried out many reforms, opened the country by railroads, telegraphs, roads and canals, and added four kingdoms to the British possessions. At the end of eight years his health gave way and he returned to England. He died on December 19, 1860.

Dal'las, George Mifflin, an American statesman and diplomat, was born at Philadelphia in 1792, and died there in 1864. He began his career by traveling as private secretary with Albert Gallatin to St. Petersburg and Ghent, and then entered upon the practice of law. Besides holding city and state positions, he was United States district-attorney, senator, minister to Russia and England and vice-president under Polk from 1845 to 1849.

Dallas, a city of Texas, the capital of Dallas County, situated on Trinity River, about one mile below the mouth of the West Fork and 315 miles north of Galveston. It is an important insurance and financial center of the southwest, and has extensive railroad connection through the following lines: The Texas & Pacific, Houston & Texas Central, Missouri, Kansas & Texas, Rock Island, Texas & New Orleans, Cotton Belt, Trinity & Brazos Valley, Santa Fe and the Frisco; and also electric lines to Ft. Worth 32 miles west and to Sherman 64 miles north. Dallas has good public schools and other institutions of learning, among which are the Texas Baptist University, St. Mary's Institute (an Episcopal college for women), Medical Department of Southwestern University, Medical Department of Baylor University and several academies and commercial colleges.

Among the important public buildings are Carnegie Library, Oriental Hotel, St. Paul's Sanitarium and the Baptist Memorial Sanitarium. Lying in a fine agricultural country, Dallas has a large trade in grain, cotton, hides, vehicles, farm and mill-machinery, saddlery and harness. It manufactures extensively cotton-gin machinery and presses, leather-goods, cotton-goods, cotton-oil products, candies, crackers, saddles, harness, buggies, furniture. It is the home of the state-fair of Texas, and has an abundant supply of good water and all modern city conveniences. Population, 92,104.

Dalles of Wisconsin, The, near Kilbourne, Columbia County, are a picturesque gorge with high vertical walls through which the Wisconsin River rushes after rains with great violence; but in dry seasons not so fast as to prevent its navigation by small steamboats. *Dalles* is a French name for the rocky gorges in which rivers sometimes for a portion of their course are confined, and flow at great speed.

Dalma'tia, a province of Austria, running along the Mediterranean and bounded by Croatia, Bosnia, Herzegovina and Montenegro. Its area is 4,940 square miles. The country is mountainous, with numerous small lakes and rivers. The highest mountain is Orjen, with an elevation of 6,235 feet. About one ninth of the land is arable; nearly half is in pasture; and woods occupy about one third. Cattle-rearing, seafaring and fisheries are the chief industries. Besides Dalmatians, the people are made up of Italians, Albanians, Germans and Jews. The Dalmatians are a fine race of men, bold and brave as seamen and soldiers, and formerly were the main support of the military power of Venice. The cities are almost all on the coast. Dalmatia once was a considerable kingdom; but after various attempts it was conquered by Rome in the time of Augustus. After the fall of the western empire, it passed successively into the hands of Goths, Slavonians, Venetians, French and Italians, and since 1814 it has formed part of Austria. In 1869–70 and again in 1881 Dalmatia was the scene of insurrections. The chief towns of the province are Zara, Spalato and Ragusa. Population, 593,784.

Dalton, John, an English chemist and natural philosopher, was born in 1766. He was appointed to the chair of mathematics at New College, Manchester, in 1793. He published notable essays and papers on scientific subjects, and also lectured in London. His atomic theory of chemical action, which he announced in 1808, gave him world-wide fame. Various academic honors were showered upon him, and the English government gave him a pension. He died on July 27, 1844.

Dalzell', John (1845–), American statesman and lawyer, was born in New York and educated at Yale, where he graduated in 1865, and two years later was admitted to the bar. He has since become widely known as a corporation and railroad lawyer, in the latter capacity acting for the Pennsylvania Railroad. In 1887 he was elected to the 50th Congress on the Republican ticket, and he has subsequently served in that assembly, usefully acting on committees of the House as well as in general legislation.

Damaraland. See GERMAN SOUTHWEST AFRICA.

Damas'cus, capital of the Turkish vilayet of Syria and the largest city of western Asia, is situated about 70 miles from Beirût on the Mediterranean, in the plain of Damascus, near the mouth of the gorge through which the Barada River forces itself into the plain. The city stands at an elevation of 2,260 feet above the sea level, and to the northwest rises Anti-Libanus, to a height of 3,840 feet, crowned by the Dome of Victory. Seen from this mountain, the city presents the form of a tennis-racquet, the suburb Meidan forming the handle, and the remainder of the city being formed on the seven canals, by which water is drawn off from the Barada. Two of these canals are the Abana and Pharpar of Scripture. (Damascus claims to be the world's oldest inhabited city). The old citadel, going back to 1219, the palace and the mosque built in the 8th century tower high above the city. There are, besides, 70 other mosques and more than 150 chapels for prayer and instruction. The religious communities occupy different quarters of the city; and embrace Christians, Jews and Mohammedans. The different industries also have each their separate quarter: the silversmith's, the saddler's, the shoemaker's, the Greek and the book-bazar. On either side of the narrow streets are the rows of arched niches, in which are the shops of the city. Each shopkeeper sits cross-legged, with his wares piled up around him, awaiting customers. Behind the mud-walls and mean entrances there are splendid houses, fitted often with barbaric splendor. One of the sights of Damascus is the procession to Mecca, called the Haj. On these festivals, for miles around, there is a sea of human beings, dressed in the brightest and most striking colors. Circassians and Afghans, Kurds and Kalmuks, Turkomans and Tecks and most of the various tribes and peoples of the east are represented in the brilliant procession.

A railroad to Medina, Arabia, one thousand miles long, was opened in 1908. The exports and imports are large. In the city there are about 5,000 hand-looms, and 10,000 workmen are employed in weaving silk, cotton and woolen fabrics, carpets and similar articles. Much is being done in education, especially by the Christians. Population, 350,000. See Parker's *Five Years in Damascus.*

Damascus-Blades. See SWORDS.

Damask, a fabric originally manufactured at Damascus, from which it derives its name. It was made of silk and was distinguished by its ornamental woven figures of fruits, flowers, animals and landscapes. The term is now applied to stuffs made for table-covers, window-curtains and furniture-coverings, with patterns woven in the loom; but not to those in which the design is printed. There are silk, linen, woolen and cotton damasks, and some are of two materials, usually dyed in different colors. Brocades and figured velvets resemble damasks, but in them the pattern is raised; while in damask the surface is flat and the pattern is distinct on both sides of the cloth. Table-linen damask is the kind most largely made. There are manufactures of damask in Great Britain and in other parts of Europe.

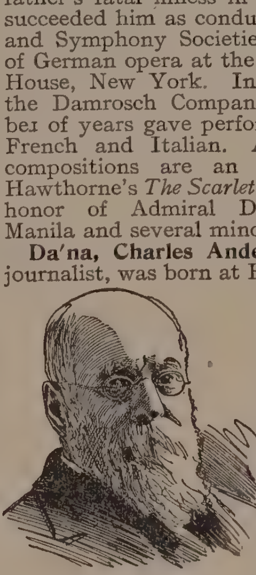
Damien (*dä'myăn'*), **Father Joseph,** a young Belgian priest who, in 1873, devoted himself to the self-denying duties of spiritual guide to the lepers confined on the Hawaiian island of Molokai. He became physician of their souls and bodies, their magistrate, teacher, carpenter, gardener, cook and even grave-digger. He was later joined by another priest. For 12 years Father Damien escaped the disease; but in 1885 the malady appeared in him; but, though his doom was sealed, he continued unabated his heroic labors. (Born 1840, died 1889.)

Damocles (*dam'ō-klēz*), one of the courtiers and flatterers of the elder Dionysius, tyrant of Syracuse. As Cicero tells the story, Damocles, having extolled in the highest terms the grandeur and happiness of royalty, was reproved in a singular way by Dionysius. Damocles was placed at a magnificent banquet, surrounded by all the splendor of royalty, and in the midst of his enjoyment, suddenly looking upward, he saw a naked sword hanging by a single horsehair above his head. The lesson taught him the uncertain nature of the happiness of kings.

Da'mon and **Pyth'ias,** two famous Pythagoreans of Syracuse, who lived early in the 4th century B. C., and whose names are always joined as the types of true and noble friendship. Pythias had been condemned to death by the elder Dionysius, tyrant of Syracuse, and was allowed to go home for the purpose of arranging his affairs, Damon pledging his own life for the appearance of his friend at the time appointed for his doom. True to his promise and in the midst of the greatest difficulties, Pythias returned just in time to save Damon from death. Struck by so noble an example of friendship, the tyrant pardoned Pythias and asked to be admitted into their sacred fellowship. It is said that not Pythias but Phintias, is the right name.

Damrosch (*dăm'rŏsh*), **Leopold,** musical director, composer and solo violinist, was born at Posen, Prussia, Oct. 22, 1832; and died in New York city, Feb. 15, 1885. His professional career began in 1855, and by 1866 he had become musical director of a Breslau theatre, and in 1871, after coming to this country, leader of the Arion Society of New York. To him music-lovers are indebted for introducing German opera into America with great *éclat,* his concerts, operas and oratorios at the Metropolitan Opera House, New York, being hailed as musical events of the season. He also was director of the New York Oratorio and Symphony Societies of that city, both of which he founded and remained leader of until his death, at the comparatively early age of 53.

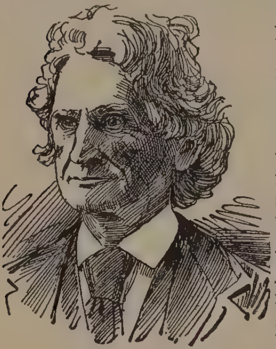
Damrosch, Walter Johannes (1862), American musician (son of Leopold), was born at Breslau, Silesia, and studied under his father and other musical experts. Coming to this country, the youthful musician in 1881 became conductor of the Harmonic Society of Newark, N. J. During his father's fatal illness in 1885 young Walter succeeded him as conductor of the Oratorio and Symphony Societies and as conductor of German opera at the Metropolitan Opera House, New York. In 1894 he organized the Damrosch Company, and for a number of years gave performances in German, French and Italian. Among his musical compositions are an opera founded on Hawthorne's *The Scarlet Letter,* a *Te Deum* in honor of Admiral Dewey's victory at Manila and several minor pieces.


CHARLES A. DANA

Da'na, Charles Anderson, an American journalist, was born at Hinsdale, N.H., Aug. 8, 1819. From 1848 to 1862 he was managing editor of the *New York Tribune,* and from 1863 to the close of the Civil War, was assistant-secretary of war. In 1867 he founded the *New York Sun,* and began the successful management of that paper on Democratic lines. Together with George Ripley, he planned and edited the *New American Cyclopædia* and its revised edition, *The*

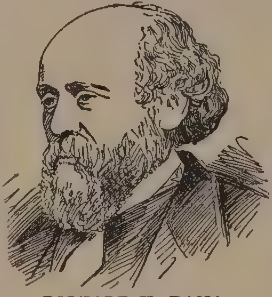
American Cyclopædia He died on Long Island, Oct. 17, 1897.

Dana, James Dwight, an American naturalist, was born at Utica, N. Y., Feb. 12, 1813. Graduating at Yale College, he was sent out in 1838 as a scientific observer in the United States exploring expedition under Wilkes, visiting the Antarctic and Pacific Oceans. During this expedition his ship was wrecked. He was for some time associate-editor of the *American Journal of Science*, and in 1846 became professor of natural history and geology in Yale. He gained world-wide distinction as a scientist. He published several works, among them *A Manual of Mineralogy* and a *Text-Book of Geology*. He died at New Haven, Conn., April 14, 1895.



JAMES D. DANA

Dana, Richard Henry, an American poet and essayist, was born at Cambridge, Mass., in 1787. After studying at Harvard, where he was concerned in a college-rebellion which prevented his graduation, he studied law. His tastes, however, were literary, and he soon became associate-editor of the *North American Review*. Some of his poems in this magazine, as *The Dying Raven* and *The Buccaneer*, were warmly praised on both sides of the Atlantic. But his best work was done in the field of criticism, and he did much to educate and elevate the literary taste of New England. For some time he published *The Idle Man*. He died at Boston in 1897.



RICHARD H. DANA

Dana, Richard Henry, Jr., an author and lawyer, was born in 1815. During his college-course he was compelled for a while to abandon his studies, because of a trouble with his eyes, and he shipped as a common sailor on a trip to California and back. This voyage he described in *Two Years Before the Mast*, the best book of the kind in the language. As a lawyer, he became distinguished and also did other literary work, including an edition of *Wheaton's International Law*. He died at Rome on Jan. 6, 1882.

Danaë (*dăn'āē*), according to Greek mythology, the daughter of Acrisius, king of Argos. The king confined her in a tower because it had been foretold that her son would kill him. Jupiter fell in love with her, and gained access to her room through the openings in the roof. She had a child by Jupiter, who was later called Perseus. Acrisius put her with her child into a chest, and the chest with its prisoners was thrown into the sea. The sea-goddesses conducted the chest safely to Seriphas, where Dictys took care of the wanderers and educated the child. Perseus finally fulfilled the prophecy by accidentally killing his grandfather.

Danaides (*da-nā'i-dēz*), in Greek story, the 50 daughters of Danaüs, who were married to the 50 sons of their uncle Ægyptus. Suspecting the sons of Ægyptus of treachery, Danaüs made his daughters promise to murder their husbands on their wedding-night. They all fulfilled this promise except Hypermnestra, who spared her husband, Lynceus. The Danaides were represented as condemned in Hades to pour water into sieves, in the vain endeavor to fill them.

Dan'bury, Conn., one of the capitals of Fairfield County, southwestern Connecticut, situated about 40 miles northwest of New Haven and 65 miles north-northeast of New York. It was settled in 1684, and was captured and burned by the British in 1777. Since then it has been noted for its manufacture chiefly of hats, being the first city to engage in this industry, and at present leading the U. S. Other manufactures are silver-plated goods, electrical goods and apparatus, art-metal ware, machinery, shirts, boots, shoes and sewing-machines. It has an excellent system of public schools, a state normal school, many beautiful churches, a public library and a city hospital. Population, 23,502.

Dan'delion. The common name of *Taraxacum officinale*, which belongs to the Composite family. It is a native of Europe and Asia, but has become naturalized throughout all temperate regions. Probably some of the Rocky Mountain forms are native. Its habit of persistent blooming and its characteristic globes of pappus are well known. Since it is prized for "greens" it has been cultivated and improved in Europe and in a few localities in this country. As a wild flower its distribution is general.

> "Dear common flower that grow'st beside
> the way,
> Fringing the dusty road with harmless
> gold."

It is a most persistent and hardy plant. Though the stem is short, the roots are long, the leaves so arranged that rain easily finds its way to the center and down to the roots. The stem is hollow, giving lightness and strength; the flower-head is made up of innumerable tiny flowers.

Bees, wasps, butterflies, beetles and flies—over a hundred insects—visit it for nectar and pollen. The seeming blossom of seed-time, the white, fluffy head, has given the plant the name of Blowball; and it is also called Peasant's Clock.

Dandolo (*dan'dō-lō*), a famous Venetian family, which gave four doges to the republic. The most illustrious of its members was Enrico, born about 1110. Eminent in learning, eloquence and knowledge of affairs, he ascended from one step to another until he was elected doge in 1192. As doge, Dandolo extended the bounds of the republic, fought and won many battles, marched at the head of the crusaders and subdued Constantinople. When the Emperor Alexius was murdered, Dandolo laid siege to Constantinople and took it by storm. He established there the empire of the Latins. He died at Constantinople in 1205. A later doge of Venice, Andrea Dandolo (1310-54), also achieved eminence.

Dane, Nathan, an American jurist, was born at Ipswich, Mass., Dec. 27, 1752, and died Feb. 15, 1835. A lawyer of high repute, he held many important public positions. But he is chiefly known through the Ordinance of 1787, which he drafted while a member of the Continental Congress. Dane also founded the Dane professorship of law in Harvard Law-School.

Dan'iel (a Hebrew word meaning God is judge) was a Hebrew prophet. According to the book which bears his name, he was descended from one of the highest families in Judah. As a youth he was carried captive to Babylon with three other Hebrew youths of rank. He and his companions were chosen for instruction in the language and literature of the Chaldeans, and the names of all four were changed—Daniel being called Belteshazzar; that is, prince of Bel. Not long after, he interpreted a dream for Nebuchadrezzar, and in consequence rose into high favor and was made governor of the province of Babylon and head-inspector of the priestly caste. This high position he kept under Darius and Cyrus, in spite of the intrigues of hostile courtiers. At one time, because he refused to give up the worship of God, he was cast into a den of lions, but was preserved and reached still higher rank. He assisted his people in their return to their native land. The book of *Daniel* was written partly in Hebrew and partly in Aramaic, and is now divided into 12 chapters, the first half consisting of narratives and the second half of predictions. The predictions are in the form of visions, which tell the story of four successive empires, perhaps the Chaldean, Median, Persian and Macedonian, culminating in the eternal kingdom of Christ.

Daniell, John Frederic, a noted English scientist, was born at London, March 12, 1790, and died March 13, 1845. He devoted himself to chemistry and meteorology, and wrote a number of essays, besides an *Introduction to Chemical Philosophy.* He was professor of chemistry in King's College, London, and received many medals and honors for his valuable scientific labors. He invented the hygrometer, a new pyrometer and the voltaic battery known by his name.

Dante (*dăn'tĕ*), **Alighieri,** the great poet of Italy, was born in 1265, in a house in the Place of St. Martin at Florence, which is still pointed out. As with many other great men, a halo of legend surrounds his early life; but he himself, in his *New Life*, tells the earliest known facts. When only nine years old, he met the Beatrice of his later poems and formed a passion for her from which he never swerved. It, indeed, influenced the whole course of his life. Dante took part in the military and political affairs of his time, when the fierce conflicts of the Guelphs and Ghibellines were tearing Florence to pieces. He rose to high office and was sent on an embassy to the pope at Rome in 1301, when the victory of the more extreme party at home resulted in the banishment of the leaders of the opposite party, Dante included; and later they were condemned to be buried alive, if caught. The remainder of the poet's life was spent in exile. He traveled about a good deal, living in Verona, Tuscany, Romagna and, finally, Ravenna, where he died on September 14, 1321, and was buried. The great work of Dante is the *Divine Comedy*, made up of three parts, giving a vision of Hell, of Purgatory and of Heaven. In it Dante gives a complete view of the highest culture and knowledge of the age on philosophy, history, classical literature, physical science, morals and religion; all this is expressed in the noblest and most exquisite poetry. This work really made the Italian language, which before was rude and unformed. No work in the world probably, except the Bible, has given rise to so much literature. It was copied in 600 different manuscripts, and about 300 printed editions have been issued; it has been more than 300 times translated into foreign languages; and unnumbered introductions, essays and commentaries have been written on or about it. Dante had not been in his grave 20 years before Italy instinctively recognized that this was her great man. About 50 years after Dante's death a public lectureship on the *Divine Comedy* was established at Florence, to which Boccaccio was first appointed. Another of Dante's works is the *Banquet.* Dante, as Boccaccio relates, was of moderate stature, stooping when he walked, slow and dignified both in gait and speech, reserved and silent in habit; but, when he spoke, keen and eloquent. He was devoted to music and painting. Boccaccio calls him "that singular splendor of the Italian race"; Carlyle: "the voice of ten silent centuries." See translations by Cary, Wright, Longfellow and Parsons-Norton. For life, character and works, see *A Shadow of Dante*, by Maria Francesca Rossetti.

Danton (*dăn'tŭn*), **Georges Jacques,** one of the great leaders in the French Revolution, was born at Arcis-sur-Aube, Oct. 28, 1759. A quiet, studious lawyer, practicing as an advocate in Paris, the fever of the times, however, soon filled his veins. Mirabeau quickly recognized his genius, and Danton became the leader of the populace. Along with Marat and Camille Desmoulins, he founded the Cordelier's Club, which soon became the rallying-point of all the hotter revolutionists. His harsh and daring countenance, his beetling black brows and voice of enormous power, thundering against the aristocrats, roused the people to fury. He became minister of justice, and for some time was the leading spirit of the Revolution. He roused the people of Paris to send forth armies to repel invaders from the soil of France. He probably had a share in the September murders in the prisons. He voted for the death of Louis XVI, and was a member of the committee of public safety. He succeeded in crushing the moderate party; but he could not restrain the forces he had created, and he himself at last fell a victim to the guillotine. The Mountain, as the ruling party was now called, saw a bloodier leader in the narrow and bitter Robespierre. When arrested, Danton showed no fear, but treated his judges with a contempt which hastened his doom. When asked his name before the bar of the tribunal, he replied: "My name is Danton, a name tolerably known in the Revolution; my abode will soon be annihilation; but I shall live in the Pantheon of history." He was guillotined on April 5, 1795. To the headsman he remarked: "Thou wilt show my head to the people; it is worth showing." See Carlyle's *French Revolution.*

Dantzic (*dant'zĭk*), an important seaport and capital of West Prussia, and a fortress of the first rank, stands on the bank of the western branch of the Vistula. It is about four miles from the river's mouth, in the Gulf of Dantzic, an inlet of the Baltic. Dantzic was an important town in the 10th century, and passed through various hands. Since 1793 it has been a city of Prussia, except during the time of Napoleon, when it existed as a separate dukedom. Several old churches and monasteries, with the town-hall and exchange, are the chief buildings. Dantzic was at one time a prominent member of the Hanseatic league, and is still one of the chief commerical cities of northern Europe. Besides its large trade by sea, river and railroad, there are many manufactures, including beer, sugar, tobacco, iron-works, etc. There is a library of 100,000 volumes. Population, 170,347.

Dan'ube, the second river of Europe, inferior only to the Volga. It is formed by the Brege and the Brigach, two mountain-streams rising in the Black Forest in Baden and uniting at Donaueschingen, 2,264 feet above sea level. At Ulm, the head of steam navigation, its elevation is about 1,500 feet; at Vienna 500 ; at Budapest 350; and at Moldova 200 feet. The Danube has a total length, including windings, of 1,740 miles, and drains an area estimated at 315,000 square miles. There are 400 tributaries, 100 of them navigable. There are three principal divisions of the river-basin. The upper course ends at Passau, where the river leaves German territory. At Passau its width is 231 yards and its depth 16 feet. The river then enters Austrian territory, and for some distance its scenery rivals that of the Rhine. It passes from the Austrian dominions through an opening called the Carpathian Gate, where it is 320 yards wide. After dividing and forming several islands, it enters the fertile Hungarian plain. Lower down, it forms the boundary between Hungary and Servia, and near Belgrade it is 1,706 yards wide. But within a stretch of 75 miles, beyond Ujpalanka are eight distinct rapids, shut in by lofty walls. The lower Klissura is the most strikingly picturesque of these; but the most difficult passage is the shortest (one and a half miles), the Iron Gate, below Orsova, where the middle course of the river ends. Here the stream has a breadth of only 129 yards, and the piled-up waters reach a depth of 28 fathoms; ledges of rock lift their tooth-like points above the surface; and all around a seething stretch of whirlpools, cataracts, eddies and counter-eddies combines with the river's rapid fall to present a serious and, formerly, impassable obstacle to navigation. Thence the lower course passes in a wide stream till it divides into the delta, through which it pours its waters into the Black Sea. The delta is a vast wilderness, covering an area of 1,000 square miles, and resembling an immense green sea of rushes; it is cut up by numerous channels and lakes, and is the haunt of sea-birds, wolves and buffaloes. The farthest mouths are 60 miles apart. The three main channels are the Kilia, St. George and Sulina. It is by the Sulina mouth that ships enter, although it discharges only two twenty-sevenths of the river's waters. The Danube is of great commercial importance. One company alone, which does a large business on its waters, has nearly 200 steamers and over 700 towboats. The Danube is connected with the Rhine by Ludwig's Canal, and with the Elbe by the Moldau, Mühl and other canals. Since 1856 the

Danube has been free to all nations. In that year was appointed the International Danube Navigation Commission, made up of delegates of all the great powers. It has almost absolute power over the mouths of the Danube and as far inland as the Iron Gate. It has already made many improvements. It has its own flag, uniform and revenue; has made laws; and keeps its own small army of police.

Danvers, a small town in Essex County, Mass., five miles from Salem on the Boston & Maine Railroad. It manufactures shoes, carpets and bricks, and has rolling-mills, tanneries and foundries. The town has churches, a public library and good public and private schools, and is the seat of Peabody Institute. This institution was founded by George Peabody, who donated $200,000 in 1852 for the promotion of knowledge and morality among the inhabitants. The Danvers Insane Asylum was built at a cost of $2,000,000. Population, 9,407.

Danville, Ill., like most of the towns in this state, is a flourishing center, and has an extensive trade in the mining and shipment of coal, taken from the contiguous bluffs. It is the capital of Vermilion County, and lies on the Vermilion River, 120 miles south of Chicago. It has a national soldiers' home, a high school, several churches, three national banks and daily newspapers, iron-foundries, planing-mills, carriage, wagon, organ and furniture-factories, together with the car and machine-shops of the Chicago, Danville & Vincennes Railroad. Its population has increased some 11,000 in the past decade, and now numbers 27,871.

Danville, Pa., a borough, the county-seat of Montaur County, on the northern branch of the Susquehanna River (with a bridge here spanning the stream), also on the Phila. & Reading and the D. L. & W. railways 41 miles southwest of Wilkes-Barre. It is the seat of the state hospital for the insane, has a good public library, and owns and operates its own water-works. In the neighborhood are coal, iron-ore and limestone deposits; while its industrial establishments embrace stove-works, rolling-mills and extensive blast-furnaces. Population, 7,517.

Danville, Va., a thriving town and important tobacco center in Pittsylvania County, southwestern Virginia, situated on the Dan River falls, 65 miles south of Lynchburg and 140 miles southwest of Richmond. It is at the junction of the Richmond, Danville and Norfolk Division of the Southern Railway and of the main line of the Danville and Western. The river furnishes power for cotton-mills, flour-mills, foundries and an electric-light "plant," and further development of its power is being made at a cost of $2,000,000. Danville is the largest loose-tobacco market in the world, having 150 tobacco-factories and manufacturing nearly 40,000,000 pounds of tobacco annually. It is the seat of Roanoke Female College (Baptist), Randolph-Macon Institute for young ladies (Methodist) and Danville Military School. Danville has a good public school system, churches, a general hospital and seven banks. Population, 19,020.

Daphne (*dăf'nē*) in the Greek myths was a river-nymph, the daughter of Gæa, goddess of the earth, and a river-god. In answer to her prayer to Zeus, Daphne was changed into a laurel, and so escaped the pursuit of Apollo, her wooer. Her lover, Leucippus, had been slain by the nymphs through the jealous wiles of Apollo. *Daphne* in the Greek means laurel.

Dardanelles (*där'dȧ-nĕlz'*), the ancient Hellespont, a narrow channel separating Europe from Asia and uniting the Sea of Marmora with the Ægean archipelago. The name is derived from the ancient city of Dardanus in the Troad. The strait has a length of about 45 miles, running from northeast to southwest, and a breadth of from one to four miles. From the Sea of Marmora a strong current runs through it. Both sides are strongly fortified. Since 1841 it has been agreed by the five great powers and Turkey that no ship of war belonging to any nation, save Turkey, should pass through the Dardanelles without the express consent of Turkey. Though nominally closed to the passage of foreign war-vessels, some modification of the prohibitory edict was in 1891 made by Turkey in favor of Russia. The Dardanelles are celebrated in ancient history by the passage of Xerxes in 480 B. C. to enter Europe and of Alexander in 334 B. C. to enter Asia. Both crossings took place near Abydos. See ABYDOS and BOSPORUS.

Dare, Virginia, the granddaughter of John White, whom Raleigh had sent in 1587 to found a settlement in Virginia, was the first child to be born of English parentage in America. The date of her birth was a few weeks after the expedition had landed, in the summer of 1587.

Darfur (*dähr-fōōr*) is a semi-independent Moslem state in Central Africa, bounded on the north by the Sahara, on the east by Egyptian Sudan and Kordofan, on the south by Bahr-el-Ghazal, on the southwest by French Congo and on the west by Wadai. It pays tribute to the Egyptian government, but its affairs are entirely within the control of its sultan for the present. Area, 170,000 square miles; capital, El Fasher; population, 1,500,000.

Da'rien, Isthmus of. See PANAMA.

Dari'us, the name of three kings of Persia, the greatest of whom was Darius I, who ruled from 521 to 485 B. C. He was the son of Hystaspes, and succeeded to the Persian throne after putting to death the usurper Gaumata, who had given himself out to be

Smerdis, the brother of Cambyses, and had seized the throne. Accurate accounts of the reign of Darius are given by means of a monument of his time, the famous inscription on the rock of Behistun. For years he had to contend with revolts in various parts of his empire. Babylon revolted twice, and the first time it resisted him for nearly two years. He organized the Persian empire, removing the seat of government to Susa, and dividing his dominions into 120 satrapies. He did much to improve the internal administration, and encouraged commerce and the arts by useful institutions and laws. He pushed his conquests as far as the Caucasus and the Indus. In 508 he had an admiral explore the river. He made an expedition against the Scythians, crossing the Bosporus on a bridge of boats, and subdued Macedonia and Thrace. He made two expeditions against Greece. In the first his fleet was wrecked at Mount Athos in 492, and in the second he was defeated at the battle of Marathon in 490. An Egyptian revolt also disturbed the latter years of his reign. Under Darius the Zoroastrian faith became the state-religion. Darius favored the Jews, and under him the second temple was built, being completed in the sixth year of his reign (515). He was succeeded by Xerxes.

Dar'ley, Felix O. C., a noted American artist, was born at Philadelphia, June 23, 1822, and died March 27, 1888. He early took to drawing with such success as to encourage him to devote himself entirely to art, especially in the form of book illustrations. Among his best known works are his outline drawings to Irving's *Legend of Sleepy Hollow* and *Rip Van Winkle.* He illustrated Cooper's and Dickens' novels, with many other works. Some of the finest figures and scenes on the government bonds and legal-tender notes were designed by him. He also turned out some larger works. After a foreign trip he brought out *Sketches Abroad with Pen and Pencil.*

Dar'ling, Grace, a name famous in the annals of heroism, was the daughter of William Darling, lighthouse-keeper on Longstone, one of the Farne Islands, and was born at Bamborough, Nov. 24, 1815. On the morning of Sept. 7, 1838, a vessel was wrecked at Harker's Rock among the islands, and was seen by Grace Darling from the lighthouse, lying a wreck on the rocks. By wonderful strength and skill she and her father brought their boat to where the nine survivors were clinging, and within a few hours all were saved. The risk was great, and the feat required great daring. Grace Darling was loaded with honors and presents, but died soon after of consumption on Oct. 20, 1842.

Darling River, a tributary of Murray River, in Australia. It is formed by the union of several headwaters, all of which rise in the great dividing range. Its length, with its tributaries, is estimated at 1,160 miles, and the system thus formed drains an area of 198,000 square miles. It joins the Murray at Wentworth, on the borders between New South Wales and South Australia. Darling also is the name of a mountain-range and of two districts in Australia.

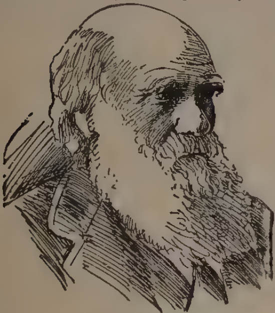
Darmstadt (*därm'stät*), a city of Germany, capital of the grand-duchy of Hesse-Darmstadt, lies on the small River Darm, 15 miles south of Frankfort-on-Main. There are several public squares and five public gardens and promenades. Among other buildings there are two palaces. The old ducal palace contains museums of paintings, natural history, etc. In Prince Charles' palace is Holbein's famous *Meyer Madonna.* There are a good trade and a number of manufactures; but the town depends more on its ducal court and government offices than on its industries. Population, 87,085.

Darnley. See MARY, QUEEN OF SCOTS.

Darrah, Mrs. Lydia, a Quaker heroine of the Revolutionary War, residing in Philadelphia in 1777, during the British occupation. From this patriot lady the English adjutant-general, the story goes, rented one of her rooms for a conference with his brother-officers; and, suspecting some plot against Washington's army, then near-by, Mrs. Darrah, it seems, overheard an order dictated to attack Washington's troops at White Marsh on Dec. 4. The information gleaned enabled Mrs. Darrah to give warning of the projected attack, and that at a critical moment, with the result that Washington was prepared to meet the British design and entirely nullify its results.

Dart'moor, a desolate upland in Devonshire, England, the source of all the principal rivers of the county. It is remarkable for its wild and rugged scenery, its trackless wastes and its mineral products. Its extreme length from north to south is 25 miles, and from east to west 20. The hills are called *tors,* and usually have crests of granite, worn by the weather into odd shapes. There are many rude stone-antiquities, earthworks and cyclopean bridges. The principal mineral products are tin and china-clay or kaolin. Dartmoor is chiefly noted as the site of a prison, built in 1806, for the custody of French prisoners of war. On the breaking out of the War of 1812, 2,500 impressed sailors, claiming to be American citizens and refusing to fight against their country, were imprisoned here, and most of them kept until the end of the war. Accounts of their harsh treatment caused much bitter feeling in the United States. The prison inclosures occupy an area of 30 acres, encircled by a double line of lofty walls. The prison now is a convict-depôt.

Dart'mouth College. See HANOVER.



CHARLES ROBERT DARWIN

Dar′win, Charles Robert, one of the world's greatest naturalists, was born at Shrewsbury, England, Feb. 12, 1809. He studied at Edinburgh University and at Christ's College, Cambridge. Both Darwin's father and grandfather were naturalists, and he early became interested in the same line of study. At the close of 1831 he sailed as naturalist on the *Beagle.* On this voyage, which lasted five years, he gained a knowledge of the animals, plants and rocks of many countries, which equipped him for his future studies. His *Journal,* giving his observations while on the *Beagle,* was published in 1839. In the same year Darwin married and settled upon his country-estate. He devoted himself largely to the problem of the origin of species, the different kinds of animals and plants. This work he carried on in spite of distressing sickness. After five years' work "he allowed himself to speculate" on the subject, and drew up some short notes. He was a cautious student, and his conclusions were not published till 1859. That year his *Origin of Species* came out. It made such a stir in the intellectual world that it is in some ways the most important book of the 19th century. In it he attempts to explain the way in which species have been evolved through a process of *natural selection,* or survival of the fittest, in the struggle for existence. We should avoid the common error of supposing that Darwinism is the same thing as evolution. His theory of *natural selection* is merely one explanation of how the evolution of life was brought about. (See EVOLUTION.) The book was received with great interest throughout the world, and was violently attacked and defended, but to-day has become accepted in the main by theologians, scientific men and philosophers. Darwin published a number of other books. His kindliness of character, honesty of purpose, devotion to truth and attachment to his friends made him loved wherever known. He died on April 19, 1882. See his *Life and Letters,* by his son, Francis Darwin, who has become a great and famous astronomer. See also "The Debt of Science to Darwin" in *The Century Magazine,* Vol. XXV, 1883.

DATE-PALM

Date, the fruit of a well-known palm, *Phœnix dactylifera,* which is native to northern Africa and Arabia, and is more or less cultivated in other tropical and subtropical regions. It is one of the most common food-articles of the Arabs, and other parts of the plant furnish them with materials for various purposes. The tree becomes 100 feet high, having a straight, rough trunk, and is said to bear its enormous clusters of fruit for one or two centuries. The date-palm has been cultivated in the Spanish parts of North America for many years, but chiefly for decorative purposes. The only part of the United States suitable for growing the tree for commercial purposes is said to be southern Arizona and southern California, where some interesting experiments are being made and considerable success has already been attained. Dates rank very high as food, and are eaten both fresh and dried. In the date-palm staminate flowers are borne on one tree, pistillate ones on another. To insure perfect pollination the Arabs cut off sprays of staminate flowers and place them in the pistillate trees. The tree is propagated by seeds and by suckers; if a certain variety is desired, suckers are used; the date is like the apple in not growing true to seed.

D'Aubigne′ (*dō-bēn-yā′*), **Jean Henri Merle,** the great Swiss historian of the Reformation and Evangelical divine, was born near Geneva, August 27, 1794; and died there, Oct. 20, 1872. He studied theology at Geneva and in Berlin, where he had Neander as his instructor, and for a time held pastoral charges at Hamburg and at Brussels, and at the latter city was preacher to the court. Returning to Geneva, he became professor of church-history in its theological seminary, and here wrote his famous *History of the Reformation in the Sixteenth Century,* his *History of the Reformation in Europe in the Time of Calvin* and works on Lutheranism and Christianity. His works on the Reformation have raised a monument to his name. They, however, are the work, not of a judge, but of an advocate.

Daubigny, Charles François (*frän-swä′ dō′bēn′yē′*), a French etcher and landscape-painter, was born in 1817. He studied with his father, with Delaroche and with others, exhibited when only 21, but did not receive full recognition for 28 years. He devoted himself to close and sympathetic study of nature, working much from a houseboat on the Seine, and painted landscape with originality, naturalness and fidelity. He also became a vigorous etcher, frank in method and retaining the painter's freedom. The *Pool of Gylien* and the *Rising Moon* rank with his best pictures. He died in 1878.

Daudet (*dō'dā'*), **Alphonse,** a modern French novelist, was born at Nîmes, May 13, 1840. His first literary work was in the line of poetry, and he spent some years writing for the stage. To *Figaro* and other journals he contributed some of his best work. One of his most noted early works is *Tartarin of Tarascon*, a most amusing satire on the characteristics of the natives of the south of France, which he followed by a second part, *Tartarin on the Alps*. Many of his later works exhibit a rich pathos, as in *Jack*. His writings generally are vigorous and lively. He died at Paris, on Dec. 16, 1897.

ALPHONSE DAUDET

Daughters of the American Revolution, a patriotic society organized by and for women, Oct. 11, 1890, with headquarters in the City of Washington and to-day having a membership in the various chapters of the order throughout the states, territories and dependencies of the Union, as well as in England, Canada and South Africa. The design of the society is to perpetuate the memory of those who took part in achieving American independence, to collect and preserve relics of the historic era and to erect monuments of notable patriots on eligible historic sites. Membership in the society is restricted to "women who are lineal descendants of an ancestor who was a military, naval or marine officer, soldier, sailor or marine in actual service under the authority of any of the 13 colonies or states or of the Continental Congress and remained always loyal to such authority, or descendants of one who signed the Declaration of Independence, or one who, as a member of the Continental Congress or the congress of any of the colonies or states or as an officer appointed by or under the authority of any such representative bodies, actually assisted in the establishment of American independence by service rendered during the War of the Revolution, becoming thereby liable to conviction of treason against the government of Great Britain, but remained loyal to the authority of the colonies or states." The society is incorporated, publishes a monthly periodical, and, besides its headquarters at the national capital, has chapters throughout the country, with a total membership (1908) of over 40,500.

Dauphin (*dạ'fĭn*), the title given to the eldest son of the king of France, the heir-apparent to the throne. The title in this form originated with Humbert II, Lord of Viennois, in 1349. Humbert died childless, and transferred his possessions to Charles of Valois on condition that the heir-apparent to the throne of France bear the title of Dauphin of Viennois. Dauphin was a title earlier held by some of the feudal lords of France who wore dolphins upon their helmets, or used them as a family crest.

Davenport, a city of Iowa ranking third in the state in population, is located on the Mississippi, 183 miles west of Chicago. The site was formerly occupied by an Indian village, and was visited by Père Marquette and Louis Joliet in 1673. The city was incorporated in 1838, and the first school was established in the same year. The population, which was 1,848 in 1850, had increased to 43,028 in 1910. Davenport is largely a manufacturing city, the capital invested in manufactures being $15,000,000, and the men employed 8,000. The value of the output, in 1909, in lumber, metal-wheels, glucose-products, wagons, cigars, pearl-buttons and other manufactures was $18,801,842.

Davenport is at the western terminus of the Illinois and Mississippi Canal, and is on six railways. It has all the institutions and agencies of the most advanced cities. Among the public institutions are Iowa Soldiers' Orphans' Home, C. C. Cook Home for the Friendless, St. Vincent's Orphanage and the Home for Old Farmers. A $75,000 public library has been erected through the munificence of Andrew Carnegie. The city has five semipublic libraries.

Davenport has five miles of river frontage and a model water-service with the largest filter-plant in the world. It is the see-city of the Roman Catholic and Episcopal denominations. The museum of the Academy of Sciences has the largest collection of relics of mound-builders extant. Its public-school system is up-to-date in every respect, and has a large enrollment. Other schools are St. Katharines Hall; St. Ambrose College; the Academy of the Immaculate Conception; and parochial and private schools.

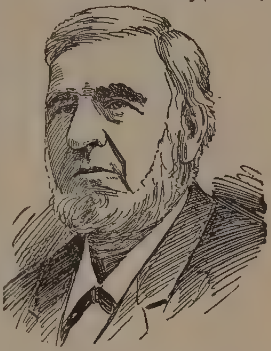
Davenport forms with Rock Island and Moline a community of 91,000 people whose social interests and commercial advantages are like those of the citizens of one place.

Da'vid, meaning beloved, the second king of Israel. He sprang from the family of Judah, and was the youngest son of Jesse. He is described as a handsome youth, "red-haired, with beautiful eyes and fair face," when he first distinguished himself in Israel by slaying the Philistine giant, Goliath. Because of his heroic deed, or because of his skill with the harp, Saul took him to his court and gave him a military command. But the king became jealous of him, and he had to flee. In the cave of Adullam, near Gath, he gathered a band of 400 freebooters, which afterward increased to 600, with which he ranged through the country, never attacking the king or his countrymen, but always their enemies. He had difficulty in avoiding the king's expeditions sent against him, and finally left Judah, becoming vassal of the Philistine king of Gath. After the death of Saul and Jonathan, at Gilboa, David reigned seven and one-half years in Hebron over Judah, and on the death of Ishbosheth he was chosen king of all Israel. He conquered the independent city of Jebus (Jerusalem), and made it the center of his kingdom, building a palace for himself on the highest hill, Zion; and placing the ark of the covenant there under a tent. In the course of a few years the conquest of the Philistines, Moabites, Arameans, Edomites and Ammonites reduced the whole territory from Egypt to the Euphrates. In the last year of his long reign of 32 years in Jerusalem, there were popular troubles and two rebellions under his sons, Absalom and Adonijah. He died between 1018 and 993 B. C. David is by far the greatest of the kings of Israel. He was courageous and skillful in war and prudent and far-seeing in government. He also was the greatest poet of his time, and the founder of the religious lyric poetry of the Hebrews — "the sweet singer of Israel."

David (*dā-vēd'*), **Jacques Louis,** a French painter, was born at Paris, Aug. 31, 1748. Before the Revolution he had produced many celebrated works, among them the *Oath of the Horatii* and *The Death of Socrates.* In the Revolution he took a prominent part; voted for the death of the king; was the artistic decorator of the great national fêtes of the Republic, which were founded on classical customs; and narrowly escaped with his life. When the Bourbons were restored, he was banished to Brussels, where he died, Dec. 29, 1825. His masterpiece, probably, is *The Rape of the Sabines.*

Davis, Cushman Kellogg, late United States senator for Minnesota, was born at Henderson, N. Y., June 16, 1838; and died at St. Paul, Minn., Nov. 27, 1900. Graduating at the University of Michigan, he studied law and practiced in Wisconsin, joining one of its infantry-regiments at the outbreak of the Civil War as lieutenant. In 1867 he was elected to the Minnesota legislature, and in 1868 became United States district-attorney for his state, and then governor (1874–75). In 1887 he took his seat in the United States senate, where he served until his death. He long served as chairman of the senate committee on foreign relations, one of whose acts was to declare war against Spain in 1898; and later was a member of the peace-commission to Paris. He was the author of *The Law in Shakespeare.*

Davis, David, an American jurist and statesman, was born in Cecil County, Md., March 9, 1815, and died at Bloomington, Ill., June 26, 1886. After graduating from Kenyon College, Ohio, he studied law in the east, and began practice in Bloomington, Ill., where he made his home. In 1844 he was a member of the state legislature, and four years later was appointed to the bench as judge of the eighth judicial district of Illinois. In 1862 President Lincoln, whose executor and intimate friend he had become, appointed him a justice of the United States supreme court. In 1877 he resigned to enter the United States senate, and in 1881 was chosen president of the chamber. Though nominally independent in politics, Judge Davis usually voted with the Democrats. In 1883 he resigned his seat in the senate, and died three years later.


JUDGE DAVID DAVIS

Davis, Henry Winter, American politician, was born at Annapolis, Md., Aug. 16, 1817; and died at Baltimore, Dec. 30, 1865. He practiced law in Virginia, and in 1854 was elected to Congress, where he served almost continuously till his death and was chairman of the committee on foreign affairs. He was a Republican in politics, and in 1860 was offered the nomination for the vice-presidency, but refused the honor. He strenuously advocated the emancipation of the slaves and the extension to them of the rights of suffrage.

Da'vis, Jefferson, was born in Christian (now Todd) County, Ky., June 3, 1808. He received an appointment from President Monroe to West Point, where he graduated in 1828. After serving in the Black Hawk War, he left the army and engaged in cotton-planting near Vicksburg, Miss. In 1845 he was elected to Congress, but resigned his seat the next year to take

JEFFERSON DAVIS

part in the Mexican War. As colonel of the First Mississippi Volunteers, he fought under General Taylor at Monterey and at Buena Vista, where he was wounded.

Mr. Davis was elected to the United States senate in 1847, resigning his seat in 1851. In 1853 he became secretary of war under President Pierce. In 1857 he again entered the senate, where he became a leader of the Democratic party and a champion of slavery and of state-sovereignty. He resigned his seat when Mississippi seceded from the Union, and was elected president of the Confederate States when that government was organized, Feb. 18, 1861. In 1862 he was re-elected to this office for a term of six years. By reason of his official position, as well as by his ability and force of character, his was the guiding hand in the long struggle. He was unwilling to give up when the cause had become hopeless. In his last message, dated March 13, 1865, he declared that, in spite of reverses, success might yet be secured. Lee surrendered at Appomattox in less than 30 days after this. On the approach of the Federal army Mr. Davis left Richmond, and, after a conference with Generals Johnston and Beauregard at Greensboro, N. C., he set out with an escort westward through Oeorgia. He was captured at Irwinville in that state, May 10, by a detachment of Federal soldiers under Lieutenant-Colonel Pritchard. He was confined at Fortress Monroe for two years, was indicted for treason in 1866, was admitted to bail May 13, 1867, but was never brought to trial. He lived in retirement until his death, at New Orleans, La., Dec. 6, 1889. In 1881 he published *The Rise and Fall of the Confederate Government.*

Davis, John Chandler Bancroft, American jurist and diplomat, was born at Worcester, Mass., Dec. 29, 1822. After graduating at Harvard, he studied law and began to practice in New York. Early in his career he was secretary of the United States legation at London, and acted as American correspondent of the London *Times.* In 1869 he became a member of the New York legislature. In the same year he was appointed assistant-secretary of state, and acted as agent of the government at the Geneva court of arbitration in the settlement of the *Alabama* claims. From 1874 to 1877 he was United States minister to Germany, and from 1878 to 1882 was judge in the United States court of claims. Latterly he has held the post of reporter for the United States supreme court. He has published *The Massachusetts Justice, Treaties of the United States* and numerous volumes of reports.

Davis, Rebecca Harding, American magazinist and novelist, was born at Washington, Pa., June 24, 1831. Her early life was spent in (West) Virginia, and her first notable story, which appeared in the *Atlantic Monthly,* in 1861, dealt with *Life in the Iron-Mills.* On her marriage to L. Clark Davis, editor of the Philadelphia *Public Ledger,* she removed to the east and for a time was on the editorial staff of the New York *Tribune.* Her chief publications include *A Law Unto Herself; Kent Hampden;* and *Dr. Warwick's Daughter.* She died Sept 29 1910.

Davis, Richard Harding, American novelist and journalist, son of the preceding, was born at Philadelphia, April 18, 1864, and educated at Lehigh and Johns Hopkins Universities. He began life as a reporter and correspondent for New York newspapers, and in 1888 became connected with the New York *Sun,* to which he contributed his early stories. He has traveled considerably, and has been managing editor for a number of years of *Harper's Weekly.* He possesses excellent descriptive power, as his *Three Gringoes in Central America* and *The West from a Car-Window* manifest. His chief publications include *Gallagher and Other Stories; Our English Cousins; Cuba in War-Time; The Rulers of the Mediterranean;* and a book on the Boer War.

Davis Strait washes the western coast of Greenland, and joins Baffin's Bay to the Atlantic Ocean. At its narrowest point, just north of the Arctic circle, the Strait measures about 200 miles across. Ginnunga Gap, spoken of in the old Norse sagas, is now known to be Davis Strait.

Davitt, Michael, Irish journalist and, with Mr. Parnell, founder of the Irish Land-League, was born in 1846, in Mayo County, Ireland, of poor parents, who were evicted from their little homestead when Davitt was a youth. This seems to have given a sinister coloring to his entire life, for we find him connected with the Fenian brotherhood in 1865, and five years later he was tried for treason-felony and sentenced to penal servitude. Released in 1882, he was in the following year arrested for seditious speech and imprisoned, and when a prisoner in Portland convict-prison he was elected to Parliament, but disqualified by vote of the House of Commons. Subsequently, when released from imprisonment, he was again elected to Parliament, but was unseated on petition, and resigned in consequence of bankruptcy proceedings against him. Mr. Davitt traveled widely, and made a tour of the United States in behalf of the Irish Land-League, of which he has written a *Defense.* He also published *Life and Progress in Australia* and *Leaves from a Prison-Diary.* He died on May 31, 1906. He was the stormy petrel of Anglo-Irish politics, but a devoted patriot.

Da'vy, Sir Humphry, one of the greatest of chemists, was born Dec. 17, 1778, at Penzance, Cornwall, England, where his father was a woodcarver. At school he got a taste for story-telling and for making scientific experiments. At 19 he settled down to the study of chemistry, soon becoming an assistant at a scientific school at Clifton. Here he became acquainted with Coleridge and Southey, and engaged in experiments on the breathing of gases, which several times nearly cost him his life. At 22 he was made lecturer to the Royal Institution of London, where his eloquence and novel experiments soon drew large and brilliant audiences. His discoveries in agricultural chemistry were important, but his fame chiefly rests on his advanced views of the science, first made known in his lecture *On Some Chemical Agencies of Electricity.* Following out the principles laid down in this essay, he made the valuable discovery that the alkalies and earths are compound substances formed by oxygen combined with metals. It was potash that he first succeeded in decomposing. When he first saw the globules of the new metal, potassium, his delight was so great that he could not go on with the experiment. Davy was knighted in 1812; he was afterward made a baronet and president of the Royal Society. He discovered the talents of Faraday and obtained his appointment as assistant in the laboratory of the Royal Institution. In 1815 he began to study the nature of fire-damp, which is the cause of explosions in coal mines. This resulted in his invention of the safety-lamp, one of the most useful of modern inventions. Said the great naturalist Cuvier, at the time of Davy's death: "Davy, not yet 52 years old, occupied, in the opinion of all who could judge of such labors, the first rank among the chemists of any age." Davy died on May 29, 1829. See his *Memoirs*, by his brother, John Davy.

SIR HUMPHRY DAVY

Dawes (*daws*), **Henry Laurens,** United States senator, was born in Cummington, Mass., Oct. 30, 1816. After graduating from Yale, he taught school, became a lawyer, a newspaper editor and a member of the state legislature. He was member of Congress from 1857 until 1873, where he became one of the prominent men of the country. He was United States senator from Massachusetts from 1875 until 1893. Senator Dawes introduced most of the bills which were passed with a view to bettering the condition of the Indians; he introduced the measure to complete the Washington monument and the weather-bulletin measure, by which weather-reports from all parts of the country are gathered and thus storms can be foretold with something like certainty. He died on Feb. 5, 1903.

Dawson (*da'sŭn*), the principal city in the Klondike region and capital of the Yukon District of Canada. It is situated on the eastern bank of Yukon River, where it is joined by the Klondike. It sprang into existence in September of 1896 at the time of the rush for gold in the Klondike, and by 1900 it had a population estimated at 25,000. The present population is about 10,000. Aside from furs, gold-mining is the only industry. The rich deposits of gold in the vicinity have given it world-wide fame. The gold is found in the beds of rivers and creeks. The area of the gold-fields is thought to be more than 100,000 square miles. The yield in 1905-6 amounted to $6,539,000. Since 1896 the district has produced $100,000,000, and systematic scientific mining is only commencing. Dawson is reached by steamer to Skagway at the head of Lynn Canal, a deep inlet into the coast of Alaska. The White-Pass and Yukon Railway is 90 miles long. Dawson is connected by telegraph with Skagway.

Dawson, George Mercer, son of Sir J. W. Dawson and late director of the geology survey of Canada, was born at Pictou, Nova Scotia, Aug. 1, 1849; and died at Ottawa, March 2, 1901. He was educated at McGill University, Montreal, and at the Royal School of Mines, London. In 1875, he was appointed to the geological survey, and explored largely in the Canadian northwest, British Columbia and the Yukon region. Much of the result of his investigations has been published in the annual reports of the geological survey of Canada. His work included the first detailed account of the surface, geology and glacial phenomena of the northern part of the American continent west of the lakes.

Daw'son, Sir John William, Canadian geologist and naturalist, was born at Pictou, Nova Scotia, October, 1820. He studied at Edinburgh, and made careful researches into the natural history and geology of Nova Scotia and New Brunswick. His scientific papers and books, especially his *Acadian Geology*, made him well-known. His *Devonian and Carboniferous Flora of Eastern North America* told of the discovery of what is believed to be the lowest form of animal life, the *Eozoön Canadense*, as it is called. He was a member of many learned societies, and for many years was principal and chancellor of McGill University, Montreal. He retired in 1893, and died at Montreal on Nov. 19, 1899.

Dayton, a city and important railroad-center of Montgomery County, O., lies on

Miami River, at the mouth of Mad River. The Miami Canal, joining Lake Erie to the Ohio, runs through it, and the city is served by eight railroads. By population it is the fifth in rank of the cities of the state. The streets are broad, some of them 133 feet wide the houses handsome, and its large courthouse is patterned after the Parthenon. Here is a national soldiers' home. The city has large water-power. It has manufactures of railroad-cars, cash-registers, cotton, woolen and iron-goods, oil, flour, paper and machinery and large limestone-quarries. It has many fine churches and other public buildings, and possesses good schools, a preparatory academy and high school and St. Mary's (Catholic) Institute for boys. Population, 116,577.

Dead-Letter Office, in the United States postal department, is the place where unclaimed letters are sent. After remaining a month in the office to which they are directed, the unclaimed or "dead" letters are sent to Washington, and opened in the dead-letter office. If the writer's address can be found, the letter is returned to him; if not, it is destroyed. In one year nearly 7,000,000 pieces of mail were received. Many had no state on the address, 3,000 had no address at all; $92,000 in cash and more than $3,000,000 in drafts were found in the letters. Thousands of magazines, illustrated papers, picture-cards and valentines were sent to hospitals.

Dead Sea, the name of a most remarkable lake in the southeast of Palestine, called in the Old Testament, the Salt Sea, Sea of the Plain or East Sea. It is 46 miles long, with a breadth of from 5 to 9 miles. Its surface, which is lower than that of any water known, is 1,292 feet below the level of the Mediterranean. The shape is that of a lengthened oval, with a promontory jutting into it on the southeast. The Dead Sea is fed by the Jordan on the north and by many other streams; but it seemingly has no outlet. The excess of water is held to be carried off by becoming vapor. The tall limestone-cliffs on the east and west, the muddy flat on the north and the low marsh on the south are all barren and dreary. On the north blackened trunks and branches of trees can be seen, incrusted with salt; while on the south is the remarkable ridge of rock-salt, seven miles long and 300 feet high, called the Ridge of Sodom. The proximity of lava-beds, pumice-stone, warm springs, sulphur and volcanic slag proves volcanic work at some time in the past. The long-held belief that the vapor given off by the lake was deathly is not founded on fact. Birds fly over and swim about on its surface. But the salt of the water is inimical to life, though some lower forms of sea-animals are found in it. The water of the Dead Sea has eight times as much salt as that of the ocean. In all lakes or ponds without an outflow the water becomes salty, its feeders all the time bringing in salt while none goes off in vapor, as the water does. The evaporation is great because of the great heat. Rain hardly ever falls; the water is nearly as blue as the Mediterranean; and, though its taste is extremely salty and disagreeable, a bath in it is refreshing. It is almost impossible for the bather to sink in it, however hard he may try. It was for a long time thought that the Dead Sea flowed over the former site of the cities of the plain (*Gen.* xix).

Deadwood, So. Dak., a city, the seat of Lawrence County, in the western part of the state and the center of the gold-mining region of the Black Hills. It is on the Burlington and Missouri River and the Fremont, Elkhorn and Missouri Valley railroads, 175 miles west of Pierre. Its industries, besides boiler-works, embrace machine-shops, lumber-mills, brick and lime-works and smelting-plants for the reduction of gold and other metals. Population, 3,653.

Deaf-Mutes. Persons who are born deaf or who lose their hearing at a very early age are usually dumb also. Children ordinarily hear sounds and then learn to imitate them; that is, they learn to repeat what they hear other persons say. It is in this way that all of us have learned to speak. But the deaf child hears nothing; cannot therefore repeat; and so remains dumb. Deafness is much more common than was supposed some years ago. It was only when the many schools now open began their useful work that the numbers of deaf-and-dumb began to appear. In the United States alone there are about fifty deaf-and-dumb schools with over 7,000 pupils. The largest school in Europe is in London; the largest in America and, probably, in the world is in New York. Owing, probably, to the better nursing of children and to greater knowledge of the disease of deafness, the number of deaf-mutes is growing less in proportion to the population, there now being only one deaf-mute to every 1,800 people. No attempt was made to teach these children of silence till the 15th century; no school was set up till the 18th century; and teaching could not be readily had for all till within the last 60 years. The principle on which the deaf are taught was discovered by Jerome Cardan, who was born in 1501. He said that, while writing is associated with speech and speech with thought, written characters and thoughts can be joined together without the go-between of sound and that the teaching of the deaf and dumb, though difficult, is possible. This is very familiar now. With us it is common for a man to teach himself to read a language, though he cannot pronounce it. Many can read French who do not and cannot speak it. Yet this idea of Cardan's was new to the world in the 16th century. The mental condition of the deaf-and-dumb is so entirely unlike that of any other of the ailing members of the human family that it is hard to be understood. The blind can be talked with and read to, and are thus placed in direct touch with the world around them. The deaf know almost nothing, because they hear nothing. Speech tells them nothing, because they cannot hear; books teach them nothing, because they cannot read. The system of teaching by signs and the manual alphabet —in which the letters are formed by different positions of the hands and fingers—is not now used so much as the oral system. The sign-language, until people go out of their way to learn the language of one, keeps the deaf shut out from the world and shut up to each other. By the oral system, the child is taught to speak by seeing how his teacher speaks—to lip-read; that is, to read the speech of his teacher and others, as expressed on their lips. He learns to speak with all, not merely with the deaf; and books, literature and, through these facilities, the world are thrown open to him. Good work for the deaf-and-dumb has been done in the United States. The institutions are well-supported by grants from the states, and are usually well-managed. There also are missions and churches, in which the services are carried on in the sign-language, both in this country and in England.

Deák (*dā′āk′*), **Francis,** was born in 1803, at Kehida, Hungary. He was chosen representative to the Hungarian diet in 1832, where he became leader of the Liberals. After the Hungarian revolution, in 1848, he became minister of justice in the national cabinet. He made every effort to ward off the war which followed, and when Kossuth came into power he resigned. In 1860 he was leader of the moderate party, and as such drew up the address to the emperor of Austria, Francis Joseph, who also was king of Hungary, demanding the constitution of 1848. This was refused; but in 1866, after Austria's losses in the war with Prussia, the demand was again preferred and this time was granted. To Deák, more than to any other man, is due the present dual government of the Austro-Hungarian empire, under which the Hungarians have practically as many rights and liberties as their old Austrian rulers. Deák died at Budapest on Jan. 29, 1876.

Deakin, Alfred, prime minister of Australia, and minister of external affairs, was born at Melbourne, Victoria, Aug. 3, 1856, and educated at Melbourne University. He entered the local legislature in 1879, and was successively minister of public works, solicitor-general, attorney-general, senior representative at the imperial conference in London (1887) and a member of the various conferences and conventions on Australian confederation. He has written a number of important works on irrigation in Australia, the United States, India and Egypt.

Dear′born, Fort, on Lake Michigan, at the mouth of the Chicago River, on the site of the city of Chicago, was built by the government in 1803 to overawe the neighboring Indians. When war was declared against the British, General Hull, then in command at Detroit, ordered the garrison of Fort Dearborn to abandon that post and proceed to Detroit. The departure was delayed, however, and when the retreat began, Aug. 15, 1812, the garrison of 75 men, including officers and 30 friendly Miami braves, with women and children (the families of the soldiers and settlers), was attacked by 500 Pottawatomies. The battle was a short one. At the first fire the Miamis ran, and the troops were soon cut to pieces. During the fight a young Indian savage crept unseen into a wagon, and tomahawked 12 of the children. When two thirds had been killed, the remainder surrendered. Captain Wells, the commander of the 30 Miamis, fought so bravely that, when at last overpowered and killed, the savages took out his heart and ate it, hoping by this means to become possessed of the courage and prowess of the heroic scout. Fort Dearborn was rebuilt in 1816, and was garrisoned most of the time till 1837. In 1857 it was torn down, all but one building, which stood until the great fire in 1871.

Dear′born, Henry, an American general, was born at Hampton, N. H., Feb. 23, 1751. He became a physician, and during his leisure studied military tactics. The day after the battle of Lexington, he marched with 60 men to the aid of the Americans and covered their retreat at Bunker Hill. He went with Arnold to Canada, and was taken prisoner at Quebec. He served as major under Gates at the capture of Burgoyne, and made a gallant charge with his regiment at the battle of Monmouth. He was twice a member of Congress, and for eight years was secretary of war under Jefferson. In 1812 he was appointed senior major-general in the United States army and commander of the northern department. In 1813 he captured York (Toronto) in Canada and Fort George at the mouth of Niagara River. Dearborn was also for two years minister to Portugal. He died at Roxbury, Mass., June 6, 1829.

Death Valley, a desert-valley in Inyo County, California, lying nearly northwest and southeast between the Paramint and Funeral Mountains. The name comes from the fact that a party of emigrants perished here in 1849. It is about 50 miles long and 35 wide. Its surface is about 250 feet below sea-level and is covered for the most part with a deposit of a white salt, mainly borax, that has been washed here from the surrounding mountains. The Amargosa River, usually a dry channel but now and then a raging torrent, drains into it a large desert tract of Nevada. The temperature remains for months near 120° F., and, as the air is almost perfectly dry, all moisture evaporates rapidly. There is little vegetation except a few scrubby species of cactus and greasewood, and little animal life except crows, jack-rabbits, buzzards, horned-toads, rattlesnakes, mice and rats. The surrounding mountains are rich in ores and minerals, as silver, gold, copper and iron. Large quantities of borax are exported.

Deborah (*dĕb′o-rȧ*), the mother in Israel, a Hebrew prophetess, judged Israel under a palm-tree on Mount Ephraim. Through her patriotism the Hebrews were delivered from the yoke of the Canaanites, under which they had lain for 20 years. She joined several of the tribes of northern Israel under Barak (meaning lightning), who completely destroyed a great army of Canaanites at Taanach, in the plain of Esdraelon, on the brook Kishon. Sisera, the Canaanite leader, fled, and was murdered in his sleep by Jael. Then "the land had rest for 40 years." The song of Deborah (*Judges* v.) is one of joy over the deliverance of the nation. It is one of the finest gems of poetry in the Old Testament, and is held to be the oldest piece of writing in the Bible.

Decalogue (*dĕk′ȧ-lŏg*), meaning ten words, the ten commandments, which are placed before the collection of laws called the Book of the Covenant (*Ex.* xx. 22; xxiii. 33). They are also found in *Deut.* v. 1–21. These commandments were summed up in two by Christ.

Decapolis (*de-kap′ō-lis*), meaning ten cities, a district of eastern Palestine, containing the cities Damascus, Philadelphia, Raphana, Scythopolis, Gadara, Hippos, Dion, Pella, Galasa and Canatha. The cities were probably rebuilt and given certain privileges after the conquest of Syria by the Romans in 64 B. C., and at some time bound together in a confederation. The word is not used for the district after the first century.

Decatur (*dē-kā′tẽr*), **Ill.**, a flourishing city in central Illinois, the capital of Macon County, with seven railroads running into it. It lies close to Sangamon River and is about 40 miles east of Springfield. It is equipped with electric railways and other modern civic conveniences, and has a number of factories, with an excellent system of water-works. It has a number of flouring and planing-mills, breweries and manufactories of iron, carriages, engines and boilers. Besides its public and high schools, it has a Roman Catholic academy and a convent and the Decatur College and Industrial School of the James Millikin University. Population, **31,140.**

Decatur, Stephen, was born at Sinnepuxent, Maryland, Jan. 5, 1779. At 19 he went to sea as a midshipman, saw some service against the French, and the next year became a lieutenant. He gained great distinction in the war with Tripoli (1801–05). His brilliant achievement of boarding and burning the captured *Philadelphia* in the harbor of Tripoli and then escaping under the fire of 141 guns was said by Nelson to be "the most daring act of the age." For this he was made captain in 1804. In the War of 1812 he captured the British frigate *Macedonian*, but afterward was surrounded by four British frigates and forced to surrender, after the loss of a fourth of his crew. In 1815 he punished the Algerians for their piracy and forced the dey to respect the American flag. The bey of Tunis and pasha of Tripoli were also made to pay damages for breaking their treaties with the United States. Decatur was killed in a duel with Commodore James Barron, March 22, 1820.

Dec′can, The, is the tableland which lies between the eastern and the western Ghats (Ghauts) in southern India. The name is at times applied to the whole of the peninsular portion of India; but more properly only to that part which lies between the Rivers Nerbudda and Krishna. The region is of historical interest. Here were fought many of the wars which secured the position of the British in India, especially those against Hyder Ali and the Mahrattas. The Mahrattas were robber-hordes whom the British only with the greatest difficulty subdued.

December (from Latin *decem*, ten), and so applied to the month called December (the 12th in our year), which was the tenth month of the year in the Roman calendar (the year with the Romans beginning in March). The Anglo-Saxons called it Yule month and midwinter month. In December the sun enters the tropic of Capricorn and passes the winter solstice.

Decemvirs (*dē-sĕm′vẽrz*), the ten men appointed to codify—that is, to arrange and make into a system—the Roman law, both public and private. Commissioners were first sent to Greece to study the Greek laws, and on their return (302 B. C.) ten patricians, with Appius Claudius at their head, were appointed to write out the laws. By the end of the next year the code was finished and set up in the Forum on ten tables of wood. The next year two more tables were added, from which the code was known as the laws of the Twelve Tables.

Decid′uous Habit. The habit of shedding leaves at the approach of winter or of a regular period of drouth. In our region nearly all the trees and shrubs have the deciduous habit, and are bare during the winter. These plants do not attempt to protect their leaves throughout the winter, as do the evergreens, but drop them and put out a fresh and larger crop at the beginning of the next season. The leaves do not fall off by ordinary decay or accident. They literally grow off, and little furrows appear near the insertion of the petiole, which gradually deepen until the leaves hang on only by a slender woody fiber, which is sooner or later snapped by the wind.

Dec′lara′tion of Independence. Not till after the battle of Bunker Hill and the appointment of Washington as commander-in-chief of all the colonial forces, was the separation of the colonies from Great Britain generally and seriously considered, though North Carolina in May, 1775, had at the famous Mecklenburg convention cut itself off from all allegiance to the mother-country. In May of 1776 Washington wrote from the head of the army, then at New York: "A reconciliation with Great Britain is impossible. When I took command of the army, I abhorred the idea of independence; but I am now fully satisfied that nothing else will save us." Before this, Massachusetts, followed by South Carolina, Georgia and North Carolina, had instructed its delegates in the Continental Congress to vote for independence. In May, Virginia, followed by New Hampshire, New Jersey and Maryland, sent similar instructions to its delegates. On June 7 Richard Henry Lee, a delegate from Virginia, moved a resolution in Congress that "these united colonies are, and of right ought to be, free and independent states and that a plan of confederation be prepared and transmitted to the respective colonies for their consideration and approbation." This resolution was adopted on June 11. Two committees were appointed under it, one to prepare a declaration of independence and the other to prepare articles of union or confederation. The committee to prepare the Declaration of Independence consisted of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman and Robert R. Livingston. They reported on June 28, but a delay was caused by the delegates from New York and Pennsvlvania not having received their instructions. It was passed on July 4, 1776, by the votes of all the colonies, each colony having one vote. The sessions of the Continental Congress were held and the Declaration signed in the old Pennsylvania state-house, known afterward as Independence Hall in Philadelphia. Here still hangs the cracked and broken Liberty Bell which, after the first reading of the Declaration, was rung for over two hours, with the firing of cannon and the beating of drums. Twenty-three years before, this bell had been cast with the prophetic words inscribed on it: "Proclaim liberty throughout all the land, unto all the inhabitants thereof."

Dec′ora′tion Day, called in the eastern part of the country Memorial Day, is the day set apart for commemorating the services of the soldiers and sailors who lost their lives in the Civil War. Speeches and processions are made in their honor, and their graves visited and decorated with flowers. It is observed by north and south alike; and in most of the states on the same day — May 30.

De Cosmos, Amor, whose real name is Dennis E. Lennox, was born in Nova Scotia, went to Australia, and in 1859 came to British Columbia. He was the first citizen of the province to advocate responsible government and union with the Dominion. From December, 1872, to February, 1874, he was premier of the province.

Deer, a general name for a considerable variety of cud-chewing and hoofed animals, including the stag, elk, Virginia deer, wapiti and reindeer. Members of the group are found in all countries except Australia, Madagascar and South Africa. The deer have solid horns which serve to distinguish them from the hollow-horned oxen and antelopes. As a usual thing the antlers are carried only by the males, and they are shed and renewed annually. The female reindeer has antlers as well as the male, and, occasionally, in other forms antlers appear as rudiments in some individual females. When the antlers are renewed, they start as outgrowths from the frontal bone and are covered with soft hairy skin and richly provided with blood-vessels. The skin covers them till they attain their full size, and while it is present they are said to be "in the velvet." They grow with great rapidity, the large antlers of a stag being completely produced in ten weeks. As soon as they are full-grown, a ring is formed at the base which pinches off the blood-vessels, and the outer covering skin begins to shrivel and come off in strips, and it is still further worn off by

VIRGINIA DEER

rubbing the antlers against trees. The red deer of Europe, commonly called the stag after it has reached an age of five years, is the most abundant form. As its name implies, its coat is of a reddish hue, becoming more grayish in the winter. The young are spotted. This animal is about four feet high at the shoulders and seven feet long. In the buck the antlers project upward and outward, and a full-grown buck presents a fine appearance. Their senses of sight, smell and hearing are very acute, and they are timid and very fleet. In America the so-called Virginia deer and the wapiti are the most representative. The Virginia deer is chestnut-red above and white underneath. It is lighter colored in winter. Deer attain a weight of 250 pounds. In autumn and winter they feed on buds, ferns, shoots and bark; in summer, on general herbage and pond-lilies. They come to drink about sunset. The Virginia deer is abundant in various wooded parts of the United States and Canada. It is most abundant in Maine, Vermont, northern Minnesota, Michigan and Wisconsin. It is called, also, white-tailed deer, from the snow-white of the under part of its long, bushy tail, which is held stiffly aloft, when the animal is frightened and running away, and is conspicuous for a long distance. Hunters sometimes call it the flag-tailed deer. The wapiti is often called the American elk, but the name elk belongs, properly, only to the moose. It is larger than the stag of Europe, being, when full-grown, eight feet long and about five feet high at the shoulders. At one time the wapiti was to be found everywhere in the United States, but is now uncommon except about the western tributaries of the Mississippi and in California and Oregon. In the latter places it is abundant. The antlers of the full-grown wapiti are four or five feet long, and three or four feet apart at the points. The moose or elk is the largest of the deer family, with broad muzzle, large nostrils, very long legs and broad flat antlers. The moose are wary and clever and among the most difficult game to approach. They are found from northern Maine to the Arctic regions and both in Europe and America. The extinct Irish elk was an allied species. Remains of the same are now found in peat-bogs of Ireland. When living, this great elk reared its antlers ten feet high, and they sometimes measured twelve feet from tip to tip. The reindeer is at home in Lapland, Finland, eastern Greenland and other northern countries. In Kamchatka reindeer are used as saddle-animals as well as for drawing sledges. The North American variety is commonly called the caribou. The caribou exists in large numbers in Nova Scotia, New Brunswick and Labrador, as far north as Hudson Bay. The United States government is now trying to preserve the reindeer of Alaska, and has so far met with great success. Among other forms in the United States is the long-eared mule-deer, with antlers branching in twos and ears eight inches long. They live on elevated plateaus in Washington, Oregon and Idaho. See Caton: *The Antelope and Deer of America* (2d ed. 1881) and Hornaday: *American Natural History*. See, also, Elk, Reindeer and Stag.

MOOSE

CARIBOU

Deerfield, Mass., a town of 2,209 inhabitants (1910), situated in Franklin County. It is at the junction of the Connecticut and Deerfield Rivers and about 33 miles from Springfield. The surrounding region is agricultural. In the town there is some manufacturing, mainly of pocket-books.

There are a public library and a good high-school. South Deerfield, a village in the township, has some importance in history as the scene in colonial times of several conflicts with the Indians. Here, in 1675, occurred the Bloody Brook Massacre which is commemorated by a marble monument. In 1703 De Rouville with his French and Indians burned the place. In Old Deerfield there is a fine monument to the soldiers.

Defiance, Ohio, a city, the county seat of Defiance County, 50 miles southwest of Toledo. It is situated at the forks of the Maumee and Auglaize Rivers, on the Miami & Erie Canal and on the Wabash and Baltimore & Ohio railways. It is in a good farming and stock-raising region, and, besides flour-mills, has many important manufactures, machine-shops, wagon-works and hoop, stave and barrel-shops. It is the seat of Defiance College, and has a public library. Population, 7,327.

Defin'itive Nucleus (in plants), a peculiar cell of the embryo-sac of angiosperms, which gives rise to the endosperm. See EMBRYO-SAC.

Defoe (*dė fō'*), **Daniel,** famous as the author of *Robinson Crusoe*, was born at London, most likely in 1661, and was the son of a butcher. He at first intended to become a minister, but instead engaged in business. Little is known of his early life; but it seems he was with Monmouth's army and also in King William's army in 1688; later on, he traveled in France and Spain and became bankrupt; but afterward he paid all or most of his debts. Toward the close of William III's reign, he became noted as an able and busy writer of pamphlets in favor of the king's policy. His poem, *The True-born Englishman*, was written to apologize for the king's being a Dutchman, by showing that the English themselves were descended from various races. Defoe was a dissenter, and as such wrote his pamphlet, *The Shortest Way with Dissenters*. The house of commons ordered the book to be burned. Defoe was tried and sentenced to pay a fine, to stand thrice in the pillory and to be imprisoned during the queen's pleasure. He stood in the pillory on the last three days of July, 1703, in the midst of a mob of friends who protected him from insult and even drank his health. While in prison, he kept on writing, and founded his *Review*, at first a weekly. In August, 1704, he was let out of prison, through the efforts of Harley, whose fortunes he followed from that time on, serving him well as a writer of political pamphlets. In 1719 he issued the first volume of *Robinson Crusoe*, which at once leaped into that popularity which it will never cease to keep. Others of his books are *Captain Singleton*, a work of much brilliancy; *Memoirs of a Cavalier*, perhaps the most real and truthful of all historical romances, which the great Chatham accepted as genuine history; *The Fortunes of Moll Flanders;* and *A History of the Plague*. Defoe died on April 26, 1731. See *Lives*, by Minto, Chadwick and Lee.

Dehis'cence (in plants), the opening of a spore-vessel or seed-vessel to discharge spores or seeds. Almost all sporangia dehisce in some way to discharge their spores, and very many fruits dehisce to discharge their seeds.

De Kalb, John, Baron, was born in Alsace on June 29, 1721. He entered the French army, and rose to be brigadier-general. In 1768 he was sent to America on a secret mission by his government. With Lafayette he joined the American army under Washington, in 1777, with the rank of major-general. In 1780 he was sent to re-inforce General Lincoln, who was then besieged at Charleston, but failed to reach him in time. At the battle of Camden he was second in command to General Gates, and was at the head of the Maryland and Delaware troops. He held his ground till Cornwallis sent against him his whole force. During the last charge he fell pierced with 11 wounds. He died three days later, Aug. 19, 1780.

De Koven, Henry L. Reginald, American musical composer, was born at Middletown, N. H., April 3, 1859, and studied at Stuttgart and Florence. Returning to America, he for a time was a musical critic on New York periodicals, but soon began a career as composer of songs and operas. His chief compositions are *Robin Hood*, *Don Quixote*, *The Mandarin*, *The Highwayman*, *The Three Dragoons*, etc.

Delacroix (*de-lȧ'krwä'*), **Eugéne,** a French painter, chief of the romantic school, was born at Charenton-Saint-Maurice, near Paris, April 26, 1799. In 1822 he exhibited his first work, *Dante and Vergil*. Other paintings are *The Massacre of Scio* and *Blind Milton Dictating Paradise Lost*. He died at Paris on Aug. 13, 1863.

Delagoa Bay (*dĕl'ȧ-gō'ȧ bā*), a now important inlet on the southeast coast of Africa, in the Portuguese province of Lorenzo Marques. It is available for vessels of large tonnage. The Olifant or Limpopo River flows into it, north of the town of Lorenzo Marques. A railway runs inland for 57 miles through the colony, and is continued through the Transvaal, 290 miles distant, to Pretoria. The Beira railway has a length of 204 miles in the colony, and is continued from the British frontier to Bulawayo. The coast region is swampy and malarial. There is telegraphic communication with the Transvaal system. It is stated that Britain, in view of the situation of affairs in South Africa, desires to purchase the Portuguese possessions in East Africa. Britain, it is understood, holding the right of pre-emption at least over Delagoa Bay and its fore-shore, which have become valuable since the acquisition of the Boer republics.

Deland′, Margaret, American novelist was born at Alleghany, Pa., Feb. 23, 1857, and was educated at Pelham Priory, New Rochelle, N. Y. In 1880 she married and settled in Boston, Mass. Her first volume was one in verse, entitled *The Old Garden. John Ward, Preacher,* her earliest novel, made a hit by its vigor and keenness in tracing the influence of certain doctrinal beliefs current in church-circles and supposed to be a part of Christianity. This was followed, among others, by *The Story of a Child; Philip and his Wife, The Common Way; Old Chester Tales;*

Delaroche (*de-lȧ′rōsh′*), **Hippolyte,** known as Paul, a French painter, was born at Paris, July 16, 1797. He first came into notice in 1824 by his pictures, *St. Vincent de Paul Preaching in the Presence of Louis XIII* and *Joan of Arc before Cardinal Beaufort.* Among his other paintings are *The Princes in the Tower* and *Cromwell Contemplating the Corpse of Charles I,* which is held to be one of the first historical paintings of modern times. Perhaps his greatest work is the series of paintings on the wall of the semicircular saloon of the *École des Beaux Arts* (School of Fine Arts). The painting comprises 74 figures, among them the greatest painters, sculptors and architects in all history. Delaroche died at Paris, Nov. 4, 1856.

Del′aware Bay separates New Jersey and Delaware. Where it flows by Cape May and Cape Henlopen and joins the Atlantic, it is 15 miles broad, It is about 60 miles in length, to the entrance of Delaware River, and its greatest breadth is from 25 to 30 miles. The main channel is from 35 to 75 feet deep, and the largest vessels can sail to Philadelphia. A large breakwater, built by the government at Cape Henlopen, affords a safe harbor.

Delaware, Ohio, a city, the seat of Delaware County, on the Whetstone River and on the Cleveland, Cincinnati, Chicago & St. Louis, the Columbus, Sandusky & Hocking and other railroads, 23 miles north of Columbus. It was incorporated in 1827, and in 1844 became the seat of the Ohio Wesleyan University of the Methodist Episcopal body. It has good churches, schools and a public library, and is noted for its mineral springs, which have remarkable medicinal properties. Its industries, besides railroad repair-shops, embrace foundries and clay-works, manufactures of chairs, carriages, gloves, woolens, flour, lumber and building-material. Population, 9,076.

Del′aware River is formed by the junction, on the boundary line of New York and Pennsylvania, of two small streams which flow from the Catskills. It separates those states till it reaches Kittatinny Mountain, about 70 miles distant, where it turns sharply southwest and separates Pennsylvania from New Jersey. Soon it passes through Delaware Water Gap, a gorge whose banks are rocks 1,000 and 1,200 feet high on either side. Easton and Trenton are passed, and tide-water is met 132 miles from the sea. Philadelphia is the head of navigation for the largest vessels. Just across the mile-wide channel is Camden. Forty miles below Philadelphia the river empties into Delaware Bay, after a course of 300 miles. The chief branches are the Lehigh and the Schuylkill. The river is connected with the Hudson by the Delaware and Hudson and Morris and Essex Canals.

Delaware, State of. This is the smallest state of the Union, except Rhode Island, being 93 miles long and from 9 to 38 broad, and covers 1,960 square miles. It lies between Delaware Bay and Maryland.

Surface. The most elevated ground in the state is behind Wilmington, and it forms the divide between Brandywine and Christiana Creeks. A fine rolling country is found in the extreme north where the Pennsylvania upland enters. A ridge which runs northwest and southeast through the state forms the watershed of Delaware and Chesapeake Bays, but follows the Atlantic coast-line. The rivers are small, but some are navigable.

Fisheries. The well-known Cypress-swamp, 50,000 acres in extent, is filled with game, and its salty inlets abound in the finest fish and oysters.

Climate. Delaware has a range of temperature between the severe extremes of New England and the heat of the south.

Agriculture. Products in the northern section consist of cereals, hay, wheat, corn, oats and sorghum; while the central and southern portion of the state is noted for its dairy-products as well as for its berries, grapes, melons, tomatoes—raised and canned—and especially its peaches. Some 10,000 carloads of peaches are shipped out yearly, besides the quantities sent by water or used in canneries and evaporating works.

Manufactures. The clays and kaolins of Wilmington are made into brick, terra-cotta and crockery. The shipyards, car-shops, powder-mills and bridge-works of Wilmington add largely to the other industries of the state. Chief among these are the manufacture of pumping and mining-apparatus, paper-making machinery and leather-goods, especially morocco.

Education. Delaware has good public schools, furnishes free text-books and maintains separate schools for its colored population and a state agricultural college for them at Dover. There are 14 academies, seminaries and high-schools; Delaware College at Newark (co-educational) has scientific and normal departments.

Government. The governor serves for four years, and has larger power in appointing to office than most governors, but has no veto-power. The state is practically out of debt. The townships are called hundreds, after an English custom older than King Alfred's time. Every county-jail still has its pillory and whipping-post. One sixteenth of the people are foreigners, and one sixth are colored. There are but three counties, and in view of the many marshes Randolph of Roanoke once said that the Delaware senators represented three counties at low tide and one county at high tide. The state is well-served with railroads. The Chesapeake and Delaware Canal, which joins the two bays at their necks, was finished in 1829. The capital is Dover, and the only large city is Wilmington (population, 87,411). The population of the state is 202,322, making it the smallest state in population except Wyoming and Nevada.

History. The first white settlers of Delaware were 32 Hollanders, who were all massacred by the Indians. In 1638 Peter Minuit was sent out by Queen Christina of Sweden, and built Fort Christina on the site of Wilmington, garrisoned with Swedes and Finns. The Dutch afterward won the province from the Swedes, and in turn were ousted by the English. The duke of York, who was proprietor both of Delaware and of New Amsterdam, granted Delaware to William Penn in 1682; but it never was considered a part of Pennsylvania. The colony took an earnest part in the Revolutionary War and suffered for its patriotism, for Lewes was bombarded and Newark and Wilmington captured by the British. Delaware was the first state to ratify the constitution. Though a slaveholding state, it did not secede during the Civil War. Delawareans are called The Blue Hen's Chickens, a nickname given their soldiers in the Revolutionary War, because of the saying of one of their officers that no cock was game unless it came from a blue hen.

Delaware or **De La Warr, Thomas West, Lord,** was appointed captain-general and first governor of Virginia in 1609. He reached the colony in the next year, with three ships. He found the colonists in despair because of scarcity of food and bad government, but by good management he made them orderly, contented and industrious. In 1611 ill-health sent him back to England. In 1618 the bad government under which the Virginians suffered turned their thoughts to Lord Delaware, and they urged him to become their governor. He set out to meet their wishes, but died on the voyage.

Delawares, a tribe of the great Algonquin family of Indians, were found by the whites in detached bands, under chiefs or sachems, dwelling on the Delaware River, and calling themselves Lenapes. The Dutch, the Swedes and the English all traded with them peaceably. William Penn bought large tracts of their lands. The Delawares claimed that they were cheated in this walking-treaty, as it was called, and at first were not going to remove. But the Pennsylvanians called on the Six Nations for help, who haughtily ordered the Delawares, as women, to retire. They at this time were composed of three clans, those of the Turtle, the Turkey and the Wolf. From this time they kept splitting into bands and changing their homes. The Ohio, Muskingum, Miami, parts of Canada, the White River of Missouri, the Red River and the Kansas were successively homes of the Delawares. Most of them now are on the Verdigris River, on lands bought from the Cherokees. The Delawares fought at Braddock's defeat, took part in the wars of Pontiac, helped the Miamis in the defeat of St. Clair in 1791, fought against the Sioux, and in the Civil War sent most of their warriers to join the north. The early Swedish settlers attempted to Christianize them; but the best work among them was done by the Moravians, beginning in 1741. In 1866 the United States government allowed them to become citizens, which they chose to do, their lands and money held by the government being divided among the members of the tribe. Tammany, the name adopted by the well-known political society of New York city, was an early Delaware chief. The Delawares now number about 1,000.

Delcassé (*dĕl-kăs-sā*), **Théophile,** French minister of foreign affairs, was born at Pamiers on Nov. 1, 1852, and began his career early. In 1889 he entered the French chamber, and in 1893 became under-secretary for the colonies, and in the following year colonial minister in the Dupuy cabinet. He was a consistent advocate of colonial expansion, and had charge of the Fashoda interests in the Méline cabinet in 1898 as minister of foreign affairs. He retained the latter post in the Waldeck-Rousseau ministry, under the presidency of Émile Loubet. In 1899 he negotiated the agreement with Great Britain as to the Nile valley and Central Africa.

Del'hi (*dĕl'ē*), the chief city of the Punjab, India, is situated on the Jumna River, 954 miles northwest of Calcutta. It is walled on three sides, has ten gates and stands on high ground. The city is joined to southern India by two railroads. Among the buildings stands foremost the famous palace of Shah Jehan, 3,200 feet long by 1,600 feet broad. In the heart of the city stands the great mosque, one of the finest in India. The *Minar*, built in the 13th century, is a pillar 238 feet high, 47 feet through at the bottom and 9 feet at the top. It has a winding staircase, wreathed with inscriptions from Koran. Modern Delhi is noted for its broad streets, the chief of which is Silver Street. It has a large wheat-trade, and its bazars are famous for gold and silver-work, precious stones, shawls and other articles of luxury.

Delhi was the capital of the Afghan and, afterward, of the Mogul empire. It was taken by the British army in 1803, and on the coronation of George V, in Dec., 1911, the capital of India was changed from Calcutta to Delhi. Population, about 200,000, more than half of whom are Hindus.

De Long, George Washington, American explorer, was born at New York, Aug. 22, 1844. After graduating at the United States Naval Academy in 1865, he set out on a voyage to Greenland in 1873. He wished very much to engage in Arctic exploration, and in 1877 his wish was fulfilled. James Gordon Bennett bought and elaborately fitted out the *Jeannette*. It was placed under the authority and protection of the United States Navy, and, with De Long in command, sailed from San Francisco on July 8, 1879, through Bering Strait, in search of the north pole. On June 13, 1881, the *Jeannette* sank, crushed by ice. De Long, with some of the party, perished on the banks of the Lena, in Siberia, in October of that year.

Delos (*dē′lŏs*), an island in the Grecian archipelago, is the smallest of the Cyclades, covering little more than one square mile. According to the old Greek story, it first was a floating island, but was fixed to the bottom by Zeus, in order that it might become a safe-resting-place for the goddess Leto in giving birth to Apollo and Artemis. Delos very early had a great festival of Apollo, attended by Greeks from many nations. The Confederacy of Delos, with Athens at its head, which was formed in 477 B. C., was so called because its deputies met at the temple of Apollo in Delos, and it kept its treasure there. After 146 B. C., when Corinth fell, Delos became a center of business. Its traffic was so great that it is said 10,000 slaves changed hands in a single day. It was noted also for its palm-trees, besides its brass and brazen vessels. Delos was laid waste in the Mithradatic war (87 B. C.), and never recovered.

Delphi (*dĕl′fī*), an old Greek town in Phocis, celebrated chiefly for its famous oracle of Apollo. From the Delphian nobles were at first taken the chief magistrates and the priests of the temple, while the Pythia, or priestess who delivered the oracle, at first always a young maiden, but afterwards a woman not younger than 50, was usually chosen from some family of poor country-people. In the center of the temple was a small opening in the ground, out of which arose an intoxicating vapor. The Pythia, having breathed this, sat down upon the tripod or three-legged stool, which was placed over the aperture in the ground, and then delivered the oracle. The oracle was either given at first in verse or else handed over to a poet employed for that purpose. As the Delphic oracle became more and more celebrated, Delphi grew into a town of great wealth, famous not only in Greece but among neighboring nations. Here the Pythian games were held, and it was one of the two places of meeting of the Amphictyonic Council. The fourth temple—the first to be built of stone—was destroyed by fire in 548 B. C., and during the next century the fifth and last was built by the Amphictyons at a cost of 300 talents or $575,000. It was faced with Parian marble and adorned with statues by the greatest living Greek sculptors. In 480 B. C., Xerxes sent a part of his army to plunder the temple; but as they climbed the rugged path that led to the shrine, a peal of thunder broke overhead and two huge crags, tumbling from the heights, crushed many of the Persians to death, while their comrades, struck with terror, turned and fled. It was, however, plundered afterward, and by Nero and by Constantine among others. In the time of Pliny there were 3,000 statues in Delphi, and within the temple for a long time stood a golden statue of Apollo.

Delta (*del′tä*) is a deposit formed at the mouth of a river from soil and other matter carried down in the stream or rolled forward upon the river bed. The name was first given to the tract of land thus formed by the Nile, which is in the shape of a triangle and resembles the Greek letter *delta* (Δ). More or less sediment is carried down by all rivers; but the forming of a delta depends upon there being no currents at the mouth of the river to sweep the sediment out to sea.

Deluge (meaning flood). By the deluge is usually meant the flood of Noah, the account of which is given in *Genesis* vi-ix. Stories of a great flood, agreeing more or less with the narrative given in the Bible, are common to most races. The Hindu story represents the god Vishnu as warning the prince Satyavarata of the coming of the flood, and furnishing him with a large vessel in which he and seven others, with their wives, were saved. The Chaldean Noah is called Xisuthrus, who sails in a ship guided by a steersman. The flood is seven days at its height, and Xisuthrus sends out first a raven, then a dove and lastly a swallow.

De Mille (*dē-mĭl′*), **James,** Canadian novelist, was born at St. John, New Brunswick, in 1837, and died at Halifax, Nova

Scotia, in Jan., 1880, where he held the post of professor of history and rhetoric in Delhousie College. Besides a number of books for boys, he wrote *Helena's Household*, a tale of Rome in the first century; *The Dodge Club*, a story of a party of Americans traveling in Italy; *The Living Link;* and other works.

De Monts, Pierre du Guast, Sieur, was the companion of Champlain in 1604, a Calvinist and patentee under the king of the country of Acadié, which he sailed from France to colonize. They wintered on the island of St. Croix, where they suffered greatly from illness and cold, explored the Atlantic coast as far south as Cape Cod the following summer, and returned to France. De Monts was also patron of the colony on the St. Lawrence in 1608.

Demosthenes (*dē-mŏs'thē-nēz*), the greatest orator of Athens and Greece, was born about 383 B. C. His father died when he was seven years old, leaving him well-off; but his guardians cheated him out of his property. When he came of age, he brought suit against them. Most of the property was lost, but the suit was useful to Demosthenes; it forced him to study law, gave him the doggedness and strength of will that marked him through life, and by making him poor drove him to the pursuit of law as a means of livelihood. At Athens the parties to a suit were made to plead their cause themselves; but they often had their speeches written by a speech-writer. Demosthenes became a speech-writer, and soon had a large practice. By the time he was 30, he was rich enough to devote the remainder of his life to politics. At this time danger threatened Greece from the north—from Macedonia, a country which the Greeks thought half-savage and held of no account in Greek politics, but which, in the lifetime of Demosthenes, destroyed the liberties of Greece. Demosthenes' fame as a statesman rests on the fact that from the outset he foresaw the danger threatened by Philip of Macedon. Had his advice been adopted, Athens and Greece might have been saved. He wanted the rich to allow themselves to be taxed for war-purposes, the poor to agree that less public money should be spent on the great national festivals, and that rich and poor alike should serve in the army, instead of employing hired soldiers. Demosthenes failed to convince his fellow Athenians, and only when it was too late was his policy adopted. When Philip attacked the state of Olynthus, the orator delivered his speeches known as the *Olynthiacs*, which with the orations against Philip, the *Philippics*, are the greatest efforts of Demosthenes. During the next few years (346–340), he was engaged in forming an anti-Macedonian party, but the fatal battle of Chæronea (338), in which Philip completely triumphed, put an end to these efforts. In 330 he made his famous speech *On the Crown*, which was a defense of his whole political career. In 324 the treasurer of Alexander the Great decamped to Athens with a large sum of money. This money was placed in the state-treasury in charge of Demosthenes and others, and when Alexander demanded it, half of it was missing. Demosthenes was accused and condemned, but escaped into exile. He was not guilty of the theft, but was condemned by his political enemies. When Alexander died, Demosthenes was recalled from exile to lead an attempt to throw off the Macedonian yoke. The battle of Crannon put an end to the revolt. Demosthenes fled, and, on being captured, poisoned himself, 322 B. C.

As a boy Demosthenes was nervous, timid and rather girlish, and his mother allowed him to shirk the gymnastic training and out-door-life in which all young Athenians took part. He further was troubled with hesitation in speaking and with shortness of breath, but his will-power overcame all these weaknesses. It is said that he forced himself to speak with a pebble in his mouth; and, to get used to talking amid the noise of the popular assembly, he would speak as he walked up and down the seashore with the waves roaring in his ears as they beat upon the rock. His hard work and great capacity for taking pains are seen in the high finish of his speeches, as distinguished above those of every orator. The dignity, pathos, might, majesty and power of his speeches rank them with those of any orator that has ever lived.

Dena'rius (Latin *deni*, ten each; from *decem*, ten), the chief Roman silver coin, first minted as early as 269 B. C. and equal in value to ten of the copper coins called *as*. As the latter became reduced in size and value, the *Denarius* in the second century, B. C. equalled about 16 of the copper or bronze coins known as *as;* though finally the silver coin dropped out of use about the third century of our era. In Nero's time the *denarius* had a value, in English money, ranging from 7½d to 9½d or about 17 cents of our decimal currency. It is the coin referred to as a penny in the New Testament.

Denis, Saint, the patron-saint of France, was sent from Rome about 250 A. D. to preach the Gospel to the Gauls. At Paris he made many converts. The Roman governor of this part of Gaul ordered Denis, with two other Christians, to be brought before him. As they kept firm in their faith in spite of threats, they were cruelly tortured and afterward beheaded. It is stated that the bodies of the three martyrs were thrown into the Seine, but were recovered and buried by a Christian woman. In 636 King Dagobert founded on the site of their graves an abbey, called St. Denis, which soon grew to be one of the richest and most important in the whole kingdom, and was long the burial-place of the French kings. For a long time the saint's name was the war-cry of the French soldiers, who charged with the cry: "Montjoye Saint Denys!"

Denison, Tex., a town in Grayson County and near the Red River in north-central Texas, on the Mo., Kans. & Texas and the Houston & Texas Central railways. It has considerable trade in fruits and agricultural products and a number of manufacturing establishments, including railway machine-shops. St. Xavier convent is situated here, and besides good public schools there also is a business-college. Denison erected the first public-school building in Texas. Population, 13,632.

Den'mark, the smallest of the three Scandinavian kingdoms, consists of the peninsula of Jutland and a group of islands in the Baltic. Besides Denmark proper, under the rule of the Danish king, are now the Färoe Islands, Iceland, Greenland and the Danish West Indies of St. Thomas, St. Croix and St. John. The area of Denmark proper is 15,592 square miles; that of Iceland, Greenland and the West Indies 86,634 square miles, with a total population of 2,775,076. Denmark is separated from Norway on the north by the Skager Rack, from Sweden on the east by the Sound and the Cattegat, and on the south it is bounded by the Prussian provinces of Schleswig-Holstein.

Surface and Drainage. The greater part of Denmark proper is low, the highest point being less than 600 feet above the sea. The coast is usually flat, skirted by sand-ridges and shallow lagoons. On the east coast are many bays useful for navigation and valuable for their fisheries, and there are many good harbors. There are no rivers, though the canals are important.

Climate. Mists and sea-fogs are frequent, and rain, snow or hail on an average 150 days in a year. In the spring a cold, dry wind, called the *skai*, whirls clouds of fine sand from the coast inland, doing great damage to the crops.

Natural Resources. The commonest tree is the beech, which nowhere flourishes as it does in Denmark, though 300 years ago, the now rare oak was the great Danish tree. Denmark is poor in minerals. Peat from the many bogs, brown coal or lignite and seaweed take the place of wood as fuel. The value of the fisheries in one year exceeded 10 million dollars.

Agriculture. About 80 per cent. of Denmark is good soil, and nearly half the people are farmers. The land for the most part is parceled out into small holdings. The main crops are oats, barley and rye; wheat, flax, hemp, potatoes, butter and bacon are other leading products. Cattle, horses, sheep and goats are raised in sufficient numbers for exportation.

Manufactures. While Danish manufactures are not of great importance, the state in 1910 had 28 distilleries, whose brandy-output was 3,300,699 gallons. Other important manufactures are beer, beet-sugar and oleomargarine.

Education. The people are well-educated. Parents are compelled to send their children to school between the ages of 7 and 14 years. There are over 3,000 elementary schools, with 370,000 pupils, beside 80 high, 31 Latin and 19 agricultural schools. There are a Royal Academy of Arts, having 10 teachers and 300 pupils, and a Polytechnic Institution with a faculty numbering 40 and 600 students. The University of Copenhagen has 95 professors and about 2,000 students, and there are numerous colleges and other advanced schools.

Government and Religion. The established religion, to which the king must belong, is Lutheranism. Denmark is a constitutional monarchy, the king having a cabinet of eight ministers. The king was chosen by the people until 1660, when people and clergy, driven by hatred of the nobles, gave the king absolute power and made the crown hereditary. A constitution was afterward granted to the nation. The present form of government was adopted in 1849. The national legislature or *rigsdag*, consists of the upper house or *landsthing* and the lower house or *folkething*, which is chosen by the people.

Army and Revenue. The army numbers some 14,000; the war-strength is 50,000; and the navy, which is small and chiefly engaged in coast defense, comprises three monitors, three torpedo-gunboats and seven torpedo-boats. The revenue about equals the expenditure—about 100 million kroners annually. (The nominal value of the kroner is 25 cents.) The state in 1911 had about 2,120 English miles of railway, 1,212 miles of which it owned; 7,979 miles of telegraph lines, and 255,141 miles of telephonic wires.

History. Denmark's history goes back to the dim twilight of the saga-period, out of which loom the figures of its heroes, their brave deeds and daring voyages. Here the Celts first had their home, and from these shores the Angles and Saxons set sail in the fifth century to conquer England; while in their place the Danes of Zealand settled on the deserted lands. The missionary Ansgar baptized a Danish king as a Christian in 826, but their being Christians did not hinder the Danes from making their usual inroads into the territory of the Franks or check the piratical voyages of the famous vikings. Gorm the

Old, who first united the islands and the mainland under one rule, opposed Christianity; but Canute, his grandson, the conqueror of England, was its zealous friend. During the reigns following that of Canute, the nobles grew powerful by means of the feudal system and ground down the once free people to serfs. Waldemar I (1157–1182) conquered Norway; while Waldemar II conquered German lands, which were lost under his successors. The great Queen Margaret (1375–1412) ruled Denmark, Norway and Sweden so well that for once the three rival Scandinavian kingdoms lived together quietly and peaceably. Christian I (1448–81), the founder of the Oldenburg line of kings, which maintained itself on the throne until 1863, was chosen king by the people, who in this case used their ancient right of election to the throne. Christian II (1513–23) was such a tyrant that he lost his throne and his freedom; the Danes chose his uncle, Frederick I, to be their king, while Sweden was forever separated from Denmark. Under Christian IV, an able ruler handicapped by the opposition of the nobles, the Danish possessions still held in Sweden were lost, and with them the undivided control of the Sound. By the 18th century the peasants had become free from serfdom and the laws were better carried out. Copenhagen was bombarded in 1801 by the British under Nelson. A second British bombardment took place in 1807, when the Danish fleet was surrendered. From this time till 1813 Denmark was in the hands of Napoleon. Then she was forced to cede Norway to Sweden. In 1864 Prussia and Austria, as the heads of the German confederation, at the point of the bayonet, forced this weak state, deserted by its allies, England and France, to give up Lauenburg, Holstein and Schleswig. Extensively dismembered as she has been, Denmark has, however, prospered through the steady and combined industries of her thrifty people. Christian IX, who came to the throne in 1863, died on Jan. 29, 1906, and was succeeded by his son who reigned as Frederick VIII until his death May 14, 1912.

Dennison, William, war-governor of Ohio, was born at Cincinnati, O., Nov. 23, 1815; and died at Columbus, June 15, 1882. After graduating at Miami in 1835, he studied law, and in 1848 became a member of the state legislature of Ohio, and in 1860 was chosen governor. He was a stanch supporter of the Union, being an anti-slavery man, and incited the state to raise and equip troops for the prosecution of the war and to provide funds for their maintenance. Under Presidents Lincoln and Johnson he was postmaster-general. Governor Dennison was a philanthropic benefactor of Dennison University (formerly known as Granville College).

Den'sity is defined as the ratio of mass to volume. This term is so frequently misused by writers on scientific subjects, that it was considered worth while by the international congress of physicists, at Paris in 1900, to pass a resolution defining this quantity as stated above. Density and specific gravity are by no means the same, although one is proportional to the other. The specific gravity of any substance is defined as the ratio of its density to the density of water. The average density of a body is the ratio of the total mass of the body to the total volume of the body, while the density of a body at any one point is the limit which is approached by the ratio of a small mass about that point to the volume of this small mass.

Den'ver, the capital of Colorado, is situated north and east of the center of the state, 922 miles west of St. Louis. It is on a level plain, 5,196 feet above the sea, beyond which rise the snow-capped peaks and deep-blue shoulders of the Rocky Mountains. Denver was founded on a barren waste, dry and treeless, in 1858, and the close of the Civil War saw it a rising frontier-town. In 40 years the mining camp has been transformed into the Queen-City of the Plains, with stately buildings of brick and yellow stone and wide, shaded streets, provided with all the appointments of a modern American city; and it has become the meeting-point of a great network of railroad lines, with four direct lines to the east. The city now covers about 75 square miles on both sides of the South Platte River. It is the center of the great mining-interests of the state. It has a United States assaying mint, and three of the largest plants in the world for the smelting of ore are located here, giving employment to 2,000 persons and having an annual output in bullion of about $30,000,000. It also has a large trade in live stock, it being the central point between the breeders on the south and the breeders on the north. It has excellent public-schools, the value of its school-buildings being more than $5,000,000; it has 95 church buildings and 160 miles of street-railway. The main water-supply for the city is brought from the mountains; underneath the city, within a thousand feet, is abundant water for artesian wells. An uninterrupted area of 200 miles of a snow-capped mountain-range from north to south, a perfect climate and a beautiful city combine to make Denver one of the most attractive places of residence in the country, while the scenic attractions and climatic advantages of Colorado attract many tourists in search of health and pleasure. Population, 213,381.

De Pauw University is located at Greencastle, Ind. This institution was chartered in 1837 as Indiana Asbury University. It was later enlarged and endowed through the liberality of Washington C. De Pauw, and in 1884 the name was changed to De Pauw University. It has a college of liberal arts, school of music, school of art and an academy. The faculty numbers 43 and the students 890.

De Quin'cey, Thomas, was born at Manchester, England, Aug. 15, 1785. His father, a linen-merchant, died when Thomas was seven years old, leaving his family well-provided for. His mother was of good family and wide culture. At school he was an apt scholar, and could talk readily in Greek at 15. When 17, his health failed, and, as his guardians refused to take him out of school, he ran away to wander and study in Wales. He soon made his way to London, where, after failing to raise money on his expectations, he was in serious want. He was finally sent to Oxford, but disliked his life there and left in 1807. It was in Oxford that De Quincey first used opium to allay pain; the use of the drug afterward became an overmastering and lifelong habit. He met Coleridge and visited Wordsworth and Southey at the English Lakes. In 1808 he went back to London, where he became an associate of Knight, Lamb, Hazlitt and other men of letters. In 1816 he married Margaret Simpson, "one of nature's gentlewomen." He edited a weekly paper and contributed to *Blackwood* and other magazines. In 1821 there appeared in the *London Magazine* his *Confessions of an English Opium-Eater*, which at once made him famous. Except a work on political economy and a novel, all his writings appeared in magazines. No magazinist of the first half of the 19th century holds a like high-place in English literature with De Quincey. His essays are on all manner of subjects, and are almost faultless in style. One of the best specimens of his impassioned prose, as it has been called, is his paper on *Joan of Arc*. He died at Edinburgh on Dec. 8, 1859.

Der'by, a manufacturing city of England, capital of Derbyshire lies on Derwent River, 129 miles northwest of London. A Roman station was on its site, and it was a royal borough in the time of Edward the Confessor. It has sent two members to Parliament since 1295. The Tower of All Saints, 175 feet high, is a fine piece of architecture. A very old chapel, that of St. Mary-on-the-Bridge, is still standing. Derby is the headquarters of the Midland Railroad, and is an important railroad-center. Its manufactures are silk, cotton, elastic web, lace, hosiery, iron, lead, shot, porcelain, marble, colors and chemicals. Silk was first manufactured here in 1719. Richardson and Herbert Spencer were natives of the town. Population, 123,433. Derbyshire is interesting for its fine churches, abbey ruins, feudal castles and manor-houses.

De Reszke, Jean, operatic singer and brother of Edouard de Reszke, was born at Warsaw, Poland, on Jan. 14, 1852. He studied under celebrated teachers in Italy and made his *début* in 1874, in Venice, as Alfonso in *La Favorita*. He has since appeared in the principal countries of the world in opera, as a tenor singer of great power and culture. He has also appeared in leading rôles in grand opera in the United States. His brother, Edouard, is possessed of a phenomenal bass voice, which he, however, uses artistically. His first appearance was at Covent Garden, London, in 1880.

Dermat'ogen (in plants). At the apex of a growing stem or root there is an embryonic region where the different parts of the plant-body are organized. That embryonic region at the apex which gives rise to the epidermis is called dermatogen, the name literally meaning the epidermis-producer.

Descartes (*dā'kärt'*), **Rene** generally regarded as the father of modern philosophy, was born at La Haye, near Tours, France, on March 31, 1596. At school he was an apt scholar, but on leaving college he found it impossible to believe what had been taught him and was at the time held to be accurate knowledge. He threw away his books and strove to forget all he had learned, so as to leave his mind free to find out what was really true in all departments of thought and study. He enlisted as a soldier, afterward traveled, and then settled down in Holland for 20 years of study and writing. Here appeared his *Discourse on Method* and other works on philosophy. Descartes also wrote on physics and mathematics; and it was in mathematics that he made his greatest and most lasting discoveries, especially in algebra; while analytical geometry was founded by him. He died at Stockholm on Feb. 11, 1650.

Deschanel (*dā'shȧ'nĕl'*), **Emile A.,** a French educator, writer and member of the French senate, was born at Paris on Nov. 14, 1819. He began his career in the field of journalism as an active Liberal, and in 1851 was exiled for his opinions. At an earlier period he was professor of rhetoric at Bourges and later on in Paris, where he became writer in the *Journal des Débats* and was also connected with *La Revue des Deux Mondes*. In 1859 he returned from exile in Brussels and devoted himself to literature in Paris, where he became professor of modern literature in the College of France and member of the chamber of deputies and of the senate. His chief writings embrace *Aristophanes; Benjamin Franklin; The Theatre of Voltaire;* and *The Romanticism of the Classics*. He died in 1903.

Des'mids, a group of plants belonging to the green algæ, but very different from the ordinary forms. The plant-body consists of a single cell which is always composed of two similar halves, usually separated from one another by a deep constriction. The desmids occur in a great variety of forms, and their walls are often ornamented by delicate markings. The markings and patterns of these peculiar bright green cells make them favorite objects under the microscope.

DESMIDS

Des Moines (*dā-mŏin′*), the capital and largest city of Iowa, is on the site of Fort Des Moines, which was a United States garrison in 1832 and at that time the farthest west of the northwest forts. At present this fort has new and modern equipment, making it one of the finest posts in the United States. It is situated in a lovely valley of the corn and blue-grass belt, surrounded by sloping hills, and is rich in coal-mines and deposits of clay and shale. Among its products are wire-fencing, carriages, pork and cotton and woolen goods, brick, sewer-pipe, etc. The output of 25 or more brick and clay-product factories exceeds 1,500 carloads annually. It is one of the leading railroad-centers of the country, having nine trunk-lines, which operate 19 distinct roads in and out of the city, besides electric-car service. Des Moines is the home of 44 insurance companies, has 94 churches, several colleges and technical schools, 47 public-school buildings, 19 banks, 4 daily papers, etc., and has a large jobbing trade. Population, 86,368

De Soto (*dā̇ sō′tō̇*), **Fernando,** was born at Estremadura, Spain, about 1498, of a good but poor family. He proceeded under other captains on a voyage to Darien in 1519 and on an expedition to Nicaragua in 1527. He helped Pizarro to conquer Peru, and returned to Spain with a fortune. Charles V now gave him permission to conquer Florida at his own expense, and made him governor of Cuba. In 1538 he sailed with 600 men, 20 officers and 24 priests. The little fleet anchored in the bay of Espiritu Santo (now Tampa Bay), on the 25th of May, 1539. The ships were sent back to Cuba, and the long search for gold was begun. For three years, harassed by Indians, lured onward by reports of wealth that lay beyond, the ever-lessening company kept up their wearisome march over a route that cannot now be clearly traced. In 1541 the Mississippi was reached and crossed, and the third winter was spent on Washita River. Returning to the Mississippi in the spring, De Soto, worn out by disappointments, died of a fever on its banks in June, 1542. In order that his death might be hidden from the Indians his body, wrapped in a cloak, was lowered at midnight into the waters of the great stream he had discovered. In the following year about half the number of the companions with whom he had set out sailed down the river in seven frail boats, and at last reached Panuco in Mexico.

Detaille, Jean Baptiste Edouard (*zhŏṅ bäp-tēst ĕd-oo-ärd, dē̇-tä′y′*), a French painter, was born in 1848, and is distinguished for his treatment of military subjects. *The Passing Regiment* is one of his best pictures. It is in Corcoran Gallery, Washington, D. C.

Detroit, the largest city and metropolis of Michigan, is situated on the Detroit River, which connects Lakes Erie and St. Clair, and is the outlet of the upper Great Lakes. The city is 18 miles from Lake Erie, 7 miles from Lake St. Clair and 284 miles from Chicago. The river at this point runs nearly east and west, so that Detroit lies on the north side of the river, facing the Canadian village of Windsor. It has an area of 35 square miles. From the public square known as Campus Martius the main avenues of the city radiate. Here is the center of the business-district, solidly built, with wide, clean streets and many tall, imposing buildings. Woodward Avenue, the main artery of the city, runs north from the river, extending into the country and dividing the city into two nearly equal parts. On the lower end of this avenue and on adjoining streets is the shopping-district, while farther out, this and adjoining avenues are marked by magnificent churches and the fine residential district. Among the notable structures are the Soldiers' Monument, the County Building, which cost some two million dollars, City Hall, the Elks Temple and the Detroit Opera House. Grand Boulevard, a macadamized thoroughfare 150 feet wide and 11 miles long, encircles the business portion of the city. Belle Isle, a beautiful island of about 700 acres, is connected with the mainland by a magnificent bridge and constitutes the main park of the city. It is an island of great natural beauty and has been improved at a cost of over two million dollars. This magnificent park, so beautifully situated and improved, together with the smaller parks which dot the city, and its broad avenues lined with trees combine to make the City of the Straits one of the handsomest cities in the country.

The growth of Detroit has been steady and substantial, resting upon the increased volume of her manufacturing and commercial interests. Its manufactories include foundries, blast-furnaces, copper-smelting works, locomotive and car-works, shipyards, iron-bridge works, safe, furniture, automobile and stove-factories and some of the largest tobacco and cigar-factories in the United States.

The city is the seat of the United States district and circuit courts of eastern Michigan. It has a law-library, an extensive public library, besides the libraries of the Masonic lodges, the trades-union council and the museum of art. It has many hospitals and philanthropic institutions, and is noted for the large number of fine churches and its well-equipped public-schools There are more than 70 school-buildings, besides three high-schools, and the expenditure for public instruction exceeds a million dollars annually. Here also are the Detroit (R. C.) College, medical schools, law-schools, etc. Detroit is an important railroad-center and is one of the five chief lake-ports.

Detroit is one of the oldest American cities. It came into the possession of the French in 1610, who built a fort here in 1701, called Pontchartrain. The British held it from 1763 till 1796, when it passed to the United States. In the War of 1812, Detroit was captured by Sir Isaac Brock and held by the British for about a year. In 1824 the city was incorporated; from 1805 to 1837 it was the capital of Michigan Territory, and for the following ten years the capital of the state. After 1847 Lansing became the state capital. Adjacent to the city and commanding it and the approaches to the river is Fort Wayne, with extensive fortifications. Population, 465,766.

Detroit River, the name given to the strait through which the waters of Lake St. Clair and of the upper lakes flow into Lake Erie. It is about 20 miles long, and deep enough to float the largest vessels.

Deucalion (*dū-kā'li-on*), the hero of the Greek story of the flood. He was the son of Prometheus and the husband of Pyrrha. When Zeus had decided to destroy the race of men by a flood, Deucalion built an ark or ship, in which he and his wife floated during the nine days' flood which drowned all the other people of Greece. On the going down of the waters, the ark rested on Mount Parnassus. To repeople the world, Deucalion and Pyrrha were told by the goddess Themis to throw behind them the bones of their mother. This they did with the stones of mother-earth, and from those thrown by Decaulion, so the story goes, sprang up men, and from those thrown by Pyrrha sprang up women.

Development of Animal Life. The building of an animal's body is the most wonderful thing in all nature. An insect, a fish or a bird begins its development as an egg, and, as the construction of the body goes on, each tissue and each organ are formed anew out of the material contained within the egg. After three weeks' incubation of the hen's egg, for example, the young chick steps into the world with heart, brain, eyes and other organs all formed—a remarkable transformation. Frogs' eggs, laid in the water, undergo similar changes without any care from the parent; tadpoles hatch from them, and in due course of time these tadpoles grow into frogs, with a different kind of body. The hen's egg is large, because there is a large quantity of food-yolk stored up for the use of the growing chick; the frog's egg is smaller, because it contains less yolk; and some eggs —for example, those of starfishes—are smaller than pin-heads. The true starting-point of the chick is a microscopic cell within the egg; and, when we look to other animals, we find that all of them, no matter how complex, start in the condition of a single microscopic cell and that, between that simple state and the fully formed animal, which is complex, there are many steps. Therefore, the adult stage of any animal represents the last step in a long series of modifications. If we could only follow the changes, step by step, we should have a means of understanding all about the construction of animals and their past history. Tracing the stages by which cells emerge into tissues, tissues into organs and how the organs by combination build the body is called embryology or development. It is an important fact to keep before us that the rudiment of all life is a cell. (See CELL-DOCTRINE.) If we look upon cells as the bricks of organic architecture, the starting-point of a many-celled animal is a single brick; but, inasmuch as each egg needs to be fertilized before developing—just as a plant-ovule must be fertilized by pollen before it becomes a seed—the single brick is a compound one, made of material derived from each parent. The development of all animals is remarkably alike; from the single cell there come, by division, many cells; these continue to feed on the yolk, to grow and divide; and thereby a large number of cells arises. These cells arrange themselves into definite layers, from which all parts of the body are formed.

The earlier view of development was that the animal existed already formed within the egg, but was exceedingly minute, and that development consisted in the expansion or growth of this animal in miniature. But William Harvey (1598-1657) and Caspar F. Wolff (1733-94) showed the falsity of this view. The latter especially in 1759 showed (in *Theoria Generationis*) the true nature of development to consist in a real becoming or gradual formation, step by step, of the organs and the animal's body. This, of course, was opposed to the view that the embryo was preformed. The acceptance of his work was long delayed on account of the opposition of Haller the great physiologist and of others, but in 1812 it began to receive notice after the long period of neglect, and in the course of a few years the truth that Wolff contended for was triumphantly established. This was the first epoch in modern embryology.

The second epoch was created by K. E. von Baer in showing that all the tissues and organs come from cell-layers or germ-layers. Baer (1792-1876) is regarded as the father of modern embryology. In 1828 he published his great work on the development of animals, in which he showed that the numerous cells, produced by division of the orginal cell, become arranged into three layers—an outer, a middle and an inner layer—and that this is true for all animals above the very lowest. These layers are called the germ-layers, and each one gives rise to a particular set of tissues and organs. For example, from the outer germ-layer there comes, in all animals, the nervous system, including the brain, spinal cord, nerves and sense-organs; the outer covering of the body with parts like scales, feathers, hair. The middle layer splits into two sheets and is very complex. It gives rise, in all animals, to muscles, heart, blood-system, connective tissue, including cartilage and bone, etc. The inner layer forms the lining of the alimentary tube, etc. It is a remarkable fact that the organs of the many different kinds of animals are essentially alike in origin. This fact unites them all on a broad plane and is of great meaning in understanding their history. It is called the germ-layer theory. Modern embryology has largely become a study of the origin and history of the germ-layers.

Another epoch of advance is marked by the work of Kowalevsky, who in 1866 broke down by embryological study the rigid line that was supposed to separate invertebrated and vertebrated animals, and thereby brought them closer together. In 1881 Balfour, one of the greatest of modern embryologists, brought together all that was known about the development of animal life, from sponges to the highest animals, and published it in his *Comparative Embryology*. From that time the advance of knowledge about this subject has been very great, and embryology is looked upon as one of the most important of the biological sciences. It enables us to get at the past history of animals, and throws much light upon their relationships one with another. All animals have had a history. Development shows what that history has been. There is good reason to believe that the higher animals have been derived gradually from the simpler ones. It follows that the higher ones had simpler ancestors, who might have lived very far in the past. In the course of their development animals repeat to a certain extent the story of their past, and, therefore, certain traces of ancestral organs make their appearance. Let us take, for example, the chick developing in the hen's egg. This is a bird; nevertheless, gill-clefts that belong to fishes and smack of a water-life, make their appearance in the developing bird and then fade away. The heart is also, at the same time, two-chambered as in the fish, and the blood vessels are arranged in the gill-arches as in the fish. These rudimentary organs are not of use to the young bird for breathing, but their presence means something; they are not there by chance. The best explanation seems to be that they are inherited from the remote ancestors of the birds, which were water-breathers. Many other rudimentary organs arise and disappear, and are explained in a similar manner. It is an astounding fact that the gill-clefts arise in all of the highest animals, without exception, and their presence is taken to indicate that the remote ancestors of all were water-breathers and had use for gills. The rudimentary organs referred to of course disappear long before the animal is hatched or born into the world. These structures give clues to former conditions, and the traces we find are like records left by the hand of time upon the embryo. The reading of this embryological record is like reading the hieroglyphics and inscriptions made by ancient people upon monuments, temples and columns, but the inscriptions on the embryo go farther back into the past. In like manner, the stages of the frog show its history. The tadpole is at the level of a fish, but it undergoes further changes and transforms into an air-breathing animal. Now, since the most complex organs of animals start in a state of simplicity, it follows that, if we take them in their simplest stages and see all the modifications as they are added, we shall be better able to understand them. This is of wide application, and shows why embryology is so important in zoology and also in botany. Observations on development throw more light on animal-life than comes from any other single source.

Wm. A. Locy.

Devonshire, Spencer Compton Cavendish, eighth Duke of (long known in English politics as Marquis of Hartington), was born July 23, 1833, and educated at Trinity College, Cambridge. He entered Parliament in 1857 as member for North Lancashire, in the Liberal interest, and in April, 1863, was made under-secretary of state for war in Lord Russell's administration. In 1866 he became secretary of war, and later was postmaster-general in Gladstone's first government. In 1874 he was chosen leader of the Liberals in the Commons, and in 1880 was offered the premiership, but declined it. In Gladstone's second administration he became secretary for India; and, when his chief formulated his home-rule policy, Hartington became recognized leader of the Liberal Unionist party. In 1891 he succeeded to the title of Duke of Devonshire, and in 1895 was made lord-president of the council in Salisbury's cabinet. In 1900 he became president of the Board of Education, but three years later he resigned office on the question of tariff-reform. He was chairman of the Unionists' Free-Trade Club. He died on March 2d, 1908.

Dew. Everyone knows that a glass of cold water, or indeed almost any cold object, when brought into a room in summer soon becomes covered with moisture. Careful observation shows that this moisture comes from the air immediately round about the cold object. In the same way, on a clear and reasonably still night, bodies which radiate heat will become cooler than the surrounding atmosphere and will, therefore, condense upon their surfaces some moisture from the surrounding atmosphere. The minute globules of water thus formed are called dew. The only difference between the formation of dew and the deposit of water upon a tumbler is that in the former case it is those bodies which *radiate* heat rapidly that collect the dew most easily, while in the latter case, it is those bodies which *conduct* heat most readily that collect the moisture of the air most rapidly. Two very important facts in connection with the deposit of dew remain to be explained. The first is that dew does not form on cloudy nights; the second is that dew does not form during a windy night. The explanation is as follows: The clouds act as a warm blanket between the radiating body and free space. Compared with the temperature of free space, clouds are very warm, and radiate much heat back to the earth. In the case of winds, if they are at all strong, they will, in passing over any body, communicate so much heat to it that the temperature of the body cannot fall as far as the dew-point, *i. e.*, the temperature at which condensation begins.

De Wet, Christian, a burgher-general in the Boer War of 1899-1902, noted for his great alertness and ability in conducting a guerrilla-warfare, was born in the Orange Free State about the year 1855. Though long a simple farmer and member of the *volksraad*, he took part in the burghers' war against the Basutos and fought against the British at Majuba Hill. In the recent war he showed himself a skillful strategist, though unfeeling and even brutal as a commander. In 1902 he made his peace with Britain, and in that year he paid a visit with General Prother to England and the United States.

Dew'ey, George, American admiral, was born at Montpelier, Vt., Dec. 26, 1837, and graduated from the United States Naval Academy in 1858. He served with distinction in the Civil War, both in the western Gulf-squadron and in the North Atlantic blockading-fleet, taking part in the battle of New Orleans and in two attacks on Fort Fisher. He was made lieutenant-commander in 1865, commander in 1873 and captain in 1884. In 1897 he was placed in command of the Asiatic squadron as commodore. He became famous by his great naval victory in Manila Bay, May 1, 1898, when he destroyed the entire Spanish fleet without the loss of a ship or a man. He was soon promoted to the rank of rear-admiral, and on March 4, 1899, was made admiral, being the third to hold this highest office in the American navy. In September, 1899, on his return from the Philippines, Admiral Dewey was accorded a great reception by the city of New York and given, with a loving-cup, the freedom of the city.

De Witt, Jan, a celebrated statesman of Holland, was born at Dort in 1625. He inherited from his father a hatred of the family of William, Prince of Orange, afterward William III of England. De Witt's influence was lost when Louis XIV of France attacked the Netherlands, as it was known that he had favored the French. William of Orange was made stadtholder or chief-magistrate of the state and appointed commander of the Dutch forces. De Witt went to visit his brother Cornelius, who had been imprisoned for conspiracy against the life of the stadtholder, when they were attacked by a mob and both were murdered at The Hague on Aug. 20, 1672.

Dextrin. See Starch.

Dhawalaghiri (*dä-wol'a-ger'ē*), once supposed to be the highest peak of the Himalayas, but now known to be at most only the third in height. It is in Nepal, and is 26,826 feet above the sea.

Di'al. A sundial is an instrument for measuring time by means of the motion of the sun's shadow cast by a stile or pin set upon its surface. It is an instrument of great antiquity, and before clocks and watches became common it was in general use as a time-keeper. A dial consists of two parts: the stile, usually the edge of a plate of metal, so adjusted that this edge will be parallel to the earth's axis and point toward the north pole; and the dial-plane or plate, made of any hard substance, on which are marked the directions of the shadow for the several hours of the day. A night-dial is an instrument for showing the hours of the night by the shadow of the moon or stars. It is to be remembered that the time indicated on the dial is apparent time and not mean solar time as given by our clocks and watches.

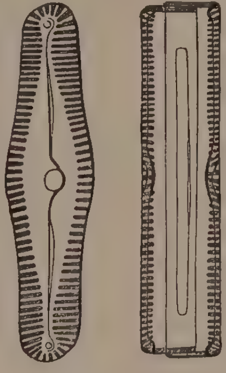
Diamond, one of the most valuable of the precious stones, is a natural form of carbon. In its natural state it often is of a dull-lead color, but when carefully cut has a brilliancy unequaled by any other stone. It is the hardest of all the minerals, and can be distinguished from other gems by this quality. A stone that will scratch a ruby or a sapphire must be a diamond. Diamonds are usually found in the sand and gravel of river-beds. India was for a long time the only country where diamonds were found, and all the great historical stones of the ancients came from that region. In 1727 diamonds were first found in Brazil. A large diamond weighing 254½ carats when found and 125 carats after cutting was picked up by a negress in 1853 in the river Bogagem. It is known as the Star of the South, and was sold to the Gaikwar of Baroda for $400,000. In 1867 diamonds were found in South Africa, not only in the river gravels but in the rocks. The principal South African diamond-mine is at Kimberley, which produced in 1905 diamonds valued at £6,758,673 (over $33,000,000). There are more large stones found in the mines of South Africa than in India or Brazil. In 1897 the Jubilee diamond of 972 carats uncut was found at Kimberley. In 1905 the Cullinan diamond, an uncut stone of 3,024¾ carats, or 1.37 pounds was found in Transvaal. It is larger than a man's fist, is part of a stone estimated to have weighed nearly 6,000 carats and is approximately valued at $2,500,000. The Transvaal purchased it and gave it to King Edward VII. Diamonds are also found in Australia, in the Ural Mountains, and in several of the United States. In 1906 a diamond-field was discovered in Arkansas. The largest diamond ever found in North America came from Manchester, Va. Artificial diamonds have been made but cost many times more than the natural diamond. Among historical diamonds are the Koh-i-nur, the Great Mogul, the Orloff, the Regent and the Hope diamond. The Koh-i-nur, meaning mountain of light, dates back to 1304. When it belonged to Aurungzebe, it was used as one of the eyes of the peacock which adorned his famous peacock-throne. When the British obtained possession of Lahore, the diamond was presented to the queen of England. The Orloff weighs 193 carats, and is mounted in the scepter of the czar of Russia. The Regent is preserved among the national jewels of France. The Hope, a sapphire-blue brilliant, is one of the most finely colored diamonds known, and is worth $150,000. See Streeter's *Great Diamonds of the World and Precious Stones and Gems.*

Diana (*dī-an'ä*), a Roman goddess, known as Artemis among the Greeks. She was the twin-sister of Apollo, and was goddess of the moon, the flocks and the chase. She is represented as a young and handsome hunter, carrying a bow and a quiver of arrows and followed by dogs or stags. As goddess of the moon she is clothed in a long robe, her head covered by a veil and a crescent moon above her brow. The most famous statue of her is the *Diana of Versailles*, found in Hadrian's villa near Tivoli, now preserved in the Louvre. Diana of the Ephesians, mentioned in the New Testament, was an Asiatic goddess entirely distinct from the Roman Diana.

DIANA

Diana, Temple of. See EPHESUS.

Di'atoms. A group of peculiar plants which are sometimes included among the algæ, and sometimes regarded as a group of thallophytes distinct both from algæ and fungi. They are one-celled, and occur in great abundance in both fresh and salt waters. They are free-swimming or attached by stalks; solitary or in chains. In form they are straight or curved, shaped like rods, boats or wedges. Their chief peculiarity is that the wall is in two halves which fit into one another like the two parts of a pill-box. The wall also is full of silica, and is practically indestructible. Diatoms occur in such vast numbers



A DIATOM FROM TWO POINTS OF VIEW

in the ocean that they form a large part of the free swimming organisms on the surface, and doubtless their siliceous skeletons are constantly falling on the sea-bottom. There are rock-deposits known as rottenearth, often used in polishing, that are absolutely made up of the skeletons ofdiatoms. On account of the fine lines which occur upon the siliceous walls, various diatoms have long been used as tests for microscopes, and the group is a favorite one with microscopists.

Diaz (*dē′ăs*), **Bartolomeu,** a Portuguese discoverer, who lived during the latter part of the 15th century. In August, 1486, the king of Portugal placed him in command of two vessels, with which to follow up the discoveries that had been made by Portuguese adventurers on the western coast of Africa. Driven by a storm, he sailed around the southern end of Africa without at first knowing it, and discovered Algoa Bay. His crew were mutinous, and he was obliged to return to Portugal, where he was received with great enthusiasm. He joined, three years later, the expedition of Cabral, a discoverer of Brazil, but was lost in a storm at sea, May 29, 1500.

Diaz, Porfirio. In 1877 it would have been unsafe for a well-dressed man to go about Mexico City unattended, while bandits infested the country-roads and robbed the mail-coaches. Thirty years later there were 20,000 miles of railway, 40,000 miles of telegraph and 22,000 post-offices; the capital is lighted by electricity and noisy with steam-locomotives and trolley-cars; and Porfirio Diaz, "perpetual president" of the republic went about afoot or in his carriage. A handsome man of middle height, he looks tall in that land of small men. In 1911, when he resigned, he was in his 80th year, his hair and mustache were snow white, but with his erect, soldierly carriage, fresh color and keen, black eyes he appeared to be in the prime of life. He had rounded out his seventh term or thirty-fourth year in the presidency, and had announced his intention of retiring. But the Mexican people would not permit him to do so and he was re-elected June 26, 1910.

PORFIRIO DIAZ

To the life of this extraordinary man history offers no parallel. His career, his achievements and his position are unique. Alone and unaided, with ability matched only by incorruptible patriotism, Porfirio Diaz transformed Mexico, lifted it from oblivion, rescued it from bankruptcy, brought order out of three centuries of chaos; won self-respect and the respect of the world for the people of Mexico from 300 years of degradation under Spanish rule.

In 1821 Mexico threw off the yoke of Spain and began its long struggle upward from poverty, ignorance and disorder. In the midst of the turmoil Porfirio Diaz was born on September 15, 1830, in the tropical state of Oaxaca. A typical Mexican of the poor class he was, and of mixed Spanish and native blood, for his grandmother was a Mixteco Indian. His father dying when he was three years of age, the boy roamed the cactus-and-aloe-strewn desert, and often sat at camp-fires with soldiers—government troops or rebels as it happened. At 17 he walked 250 miles to enlist in defense of his country in the Mexican War (1848), and saw half of Mexico's territory signed away to the United States in the year (1849) that gold was discovered in California.

That war over, Diaz became a rebel against Santa Anna's corrupt and oppressive rule. For the next 25 years, in fact, a Mexican patriot had no choice but to be a rebel and outlaw, for the country was ruled successively by dictators, despoilers and invaders. In 1862 President Juarez, thinking to relieve the impoverished land, suspended payment of the national debt to Great Britain, France and Spain. The United States, then in the second year of the Civil War, was unable to resist the invasion of Mexico by 40,000 French troops and the establishment of the Austrian archduke Maximilian as emperor in Mexico City. At the head of a patriot-army Diaz resisted French occupation. He was wounded, imprisoned, was a fugitive and an exile, had his army scattered, was offered bribes to desert his cause; but he helped bring about the downfall of the alien empire. The election of Juarez as president (1871) was the signal for a new revolution led by Diaz. The year 1877 saw the hero of 50 battles installed president in Mexico City by a victorious army.

The fighting stopped immediately, for the first time in 60 years. Mexico was told to go to work, live peacably and pay her debts. In theory the democratic form of government was preserved, but in practice the patriarchal was adopted. Diaz became the fatherly ruler, guiding and restraining. The people were poor and ignorant, the land devastated, perishing. After two generations of treachery, self-seeking and strife, education, industry, civic honesty and peace must slowly build up the land and people. Diaz stamped out rebellion relentlessly. It was years before the world understood his lofty patriotism. It was expected that he would declare himself dictator and then emperor. Rooted deep in the affections of the people, he could have worn a crown. Instead, he cut his official salary to $15,000 a year, and shamed wealthy officials from accepting any salary at all.

When Diaz became president in 1877, Mexico had about 9,000,000 people, of whom 8,000,000 or more were ignorant, poverty-stricken peons. To-day there are 15,000,000 people with a large middle class of public-spirited citizens capable of voting intelligently. Of railroads it had 500 miles, to-day 19,000, of which 10,000 are partially owned by the government. The revenues of $15,000,000 have been increased to $120,000,000 with a constant decrease in taxes. Thirty years ago Mexico had no credit. To-day it has a bonded debt of $200,000,000 and a surplus of $78,000,000. Its debt doubled by depreciation of silver, it adopted the gold standard and met its obligations. The sum of $12,500,000 has been spent on Vera Cruz harbor and $30,000,000 on the National Railway and on two harbors on the Isthmus of Tehuantepec. Imports and exports have grown from $18,000,000 to $248,000,000. Foreign capital to the extent of $1,200,000,000 has been invested in Mexican mines, railways, factories and plantations, and $200,000,000 of new money are pouring in every year. Public education has been established, manufacturing and trade are on the increase. The revenues were honestly collected and expended. There have been no public scandals. The uncrowned king of this republic has no private fortune. He lived on his salary of $25,000 a year, in a modest house in the city or in Chapultepec Castle, in simpler style than do many citizens. Once, when Diaz was reported to be seriously sick, Mexican bonds fell several points. Not long after the inauguration of Diaz in December, 1910, there appeared evidences of popular unrest, and early in 1911 there came open revolt under the leadership of Francisco I. Madero. Demands for reforms and broader exercise of popular rights were met by sweeping concessions from Diaz and his cabinet, but still the revolt grew. There was fighting at different points in the Republic, chiefly in the north. At length, rather than see his country deluged in war, Diaz resigned his office as president, and on May 31 he sailed from Vera Cruz for Europe, an exile from the land he had so greatly developed and enriched. (See MEXICO.)

Dichogamy (*dī-kŏg′ȧ-my*) (in plants). The condition in flowers in which the stamens and pistils do not mature at the same time. For example, the stamens may be ready to shed pollen when the stigma is not yet ready to receive it, or the stigma may be ready to receive pollen before the stamens are ready to shed it. There thus are two forms of dichogamy, one in which the stamens mature first (protandry), the other in which the stigma is ready first (protogyny). See POLLINATION.

Dichotomy (in plants). The method of branching in which the tip of the axis divides. The contrasting method is monopodial branching. See BRANCHING.

CHARLES DICKENS

Dick′ens, Charles, a great English novelist, was born at Landport, near Portsmouth, Feb. 7, 1812; and died at Gadshill, near Rochester, England, June 9, 1870. When he was nine years old, the family fell into poor circumstances and moved to one of the poorer quarters of London, where the father was soon after arrested for debt, and Charles was placed in a blacking-factory. Not long after, his father was released and Charles was sent to school once more, where he stayed for three or four years. He then prepared himself to be a journalist, and became reporter on a London paper when he was 22. He then began writing for magazines and journals, and in 1836 his success was assured by the appearance of *Pickwick Papers*. Others of his works soon followed, and the remainder of his life was a record of one literary success after another. In 1842 Dickens visited America. His *American Notes* and *Martin Chuzzlewit* are satirical accounts of American manners and life. In 1850 he founded *Household Words*, a weekly periodical, in which several of his works appeared as serials. In 1859 this periodical ceased to be published, but Dickens issued another, called *All the Year Round*, for which were written several other of his novels. Dickens always had a strong liking for the drama, and often acted in private theatricals. His real ability as an actor was shown in his public readings of selections from his works. He gave many of these readings both in England and America, and it is said that his receipts in money from them were more than from all his novels. Perhaps more than any other English writer, Dickens put his own boyhood into his novels. Mr. and Mrs. Micawber are drawn from his own father and mother. *David Copperfield*, probably his greatest work, is said to be largely a story of his own life; while many others of his characters he had met when a boy, in his work at the blacking-factory, when visiting his father at the debtor's prison, at the Portsmouth dock where his father was a navy-clerk, or while he was at school. Few novelists are so universally read; probably no one is so universally liked. His characters are taken from actual life, and call out the best sympathies of the reader. Among his works, besides those already noticed, may be mentioned *Old Curiosity Shop*, *Dombey and Son*, *Little Dorrit*, *Tale of Two Cities*, *Our Mutual Friend*, *A Christmas Carol* and *The Mystery of Edwin Drood* (unfinished). See his *Letters* and the *Life* by Forster.

Dick′inson, Anna Elizabeth, an American lecturer and author, was born at Philadelphia, Oct. 28, 1842. She early began to lecture on temperance and against slavery, and meantime was employed at the United States mint at Philadelphia, but afterward lost her position and then made lecturing her profession. She spoke in the political campaigns of several states in 1863. She was opposed to the election of Lincoln in 1864, and favored that of Greeley in 1872. During the war she delivered many patriotic addresses, and since then has spoken often on woman's suffrage and other questions. In 1875 she went on the stage, writing two plays, in both of which she acted the principal part.

Dickinson, Emily, an American poet, was born at Amherst, Mass., Dec. 10, 1830, and died there, May 15, 1886. A recluse all her life, she wrote much but published little. In 1890, however, a collection of her verse appeared that severe critics recognized as revealing a rare genius and as enriching American literature with minor lyrics of unique form. Another collection was published in 1892, and her letters in 1894.

Diclinous (*dĭk′lĭ-nŭs*) **Flowers.** Those which contain either stamens or pistils, but not both. Staminate and pistillate flowers, therefore, are diclinous. This diclinism may involve not merely the flowers but the plants which bear them. For example, staminate and pistillate flowers may occur on the same plant, in which case it is said to be monœcious. In other cases the staminate and pistillate flowers may be upon different plants, in which case the plants are said to be diœcious.

Dicotyledons (*dī-kŏt′ĭ-lē′dŭns*). One of the two subdivisions of the great plant group *Angiosperms*. Dicotyledons are the highest group of plants in rank, and they also contain more species than any other group, nearly 100,000 having been described. They are herbs, shrubs and trees of every variety of size and habit. The name comes from the fact that the embryo develops two cotyledons. The other features which distinguish the group in general are the structure of the stem, in which the woody bundles form a hollow cylinder; the net-veined leaves; and the parts of the flowers in fives or fours. There are two great series of dicotyledons which are distinguished from one another by their petals. In the first series either there are no petals at all, or they are separate from one another. To this series belong the common forest-trees (as oak, hickory, walnut, beech, elm, poplar), buttercups, water-lilies, mustards, roses, legumes and umbellifers. In the second series the petals are united to form urns, tubes, funnels and like forms. To this series belong the heaths, morning-glories, phloxes, gentians, mints, verbenas and composites.

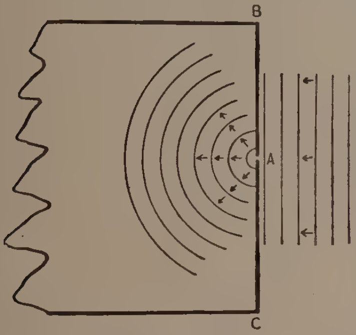
Diderot (*dē′d′-rō′*), **Denis,** was born at Langres, in Champagne, France, on Oct. 5, 1713, of cutlery-manufacturing family. Refusing to become either a lawyer or a physician, his father cut off his allowance, and for ten years he led a haphazard life in Paris as tutor and hackwriter for booksellers. The first book he wrote got him into hot water, as it was ordered to be burned by the government. For writing another he was imprisoned. His commanding position in the world of letters came with his appointment as editor of a new encyclopædia. The various volumes appeared between 1751 and 1765. What the publishers had intended to be an encyclopædia became, in Diderot's hands, an engine of war on what was known as the philosophical party in France. The beliefs and ideas of this party here found expression, and the leaders of the party came to be known as the encyclopædists. When it is called to mind that these ideas were the first entering of the wedge that later upset France in the Revolution of 1789, it will be understood how bitter the government was against these philosophers. Diderot enlisted nearly all the important French writers of the time as contributors. For some twenty years he stood at his post in spite of dangers and drawbacks. The book was again and again threatened with persecution, and Diderot was all the time in danger of imprisonment or exile. Diderot was a very ready writer, and wrote a great deal. He wrote novels, plays, satires, philosophical essays and criticisms of pictures and books. In his later years the author fell into money-troubles, from which he was rescued by Catharine II of Russia, who bought his library and allowed him to keep it in Paris, paying him for taking care of it. Diderot died at Paris on the 30th of July, 1784. See *Diderot and the Encyclopædists*, by John Morley.

Dido (*dī′dō*), according to the old stories the founder of Carthage, was the daughter of the king of Tyre and the sister of Pygmalion. Pygmalion succeeded to the throne, and murdered Dido's husband and her uncle, Sichæus, who was a priest of Hercules, but searched in vain for the treasure that Sichæus was known to have. With this treasure and many Tyrians Dido escaped to sea. She landed in Africa near Utica, and built a city called Byrsa, meaning the hide of a bull, on a piece of land which she bought. It is said she bargained for as much land as could be covered by a bull's hide. Once the agreement was made, she cut the hide into small thongs and so surrounded a large piece of ground, on which rose the city of Carthage. Vergil represents Dido's death to have been caused by the desertion of Æneas, who left her and sailed to Italy.

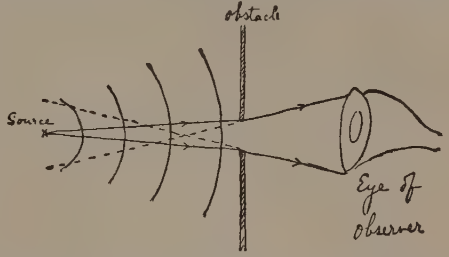
Dies Iræ (*dī'ēz ī'rē*), the name of a celebrated Latin hymn, the title coming from the first line, *Dies iræ, dies illa.* Its subject is the Last Judgment. It first appeared at Venice in 1250. No religious poem has been oftener translated; but no one of the hundred or more versions which have been made is equal to the original in poetic fire and religious fervor. This is Scott's rendering of the first stanza:

> The day of wrath! that dreadful day.
> When heaven and earth shall pass away!
> What power shall be the sinner's stay?
> How shall he meet that dreadful day?

Diffrac'tion, a phenomenon which occurs when waves of any kind pass the edge of an obstacle. The simplest illustration of the phenomenon is perhaps the case of waves washing up against a breakwater with an opening in it. As shown in the accompanying figure, the wave does not pass through the small opening A undisturbed, but spreads out in all directions, giving rise to a series of more or less spherical waves. This spreading out is called diffraction, which is merely the Latin word for bending apart. The easiest waves with which to observe diffraction are light-waves. For this purpose it is only necessary to take a sewing-needle and prick a very small hole in a visiting card. Now hold this hole immediately in front of the eye and look through it at some small or narrow source of light, say the filament of an incandescent lamp. The filament will not appear so bright as without the card, but it will appear much wider, showing that the light-waves from any one point on the filament, in passing through the small hole (that is, in passing the edge of the obstacle) are spread out into a cone, as indicated in the accompanying figure, so that the source of light appears to subtend the angle included between the dotted lines This phenomenon is known as the diffraction of light. Sound-waves behave in the same way. A beautiful case of diffraction, which may be observed almost any evening on a street illuminated by arc-lights, is the following: a twig of a tree, a lead-pencil or any opaque object will give a shadow on a white card which you may hold in your hand. This shadow will be bordered by two or three lines alternately bright and dark. These bands are due to diffraction past the edge of the opaque obstacle. They were discovered more than 200 years ago by an Italian, and are called, after him, Grimaldi's fringes. The explanation of them, which is too long for this brief sketch, was first given by Fresnel in the early part of the 19th century. See Preston's *Theory of Light.*



The effect produced upon waves by a small opening in a breakwater



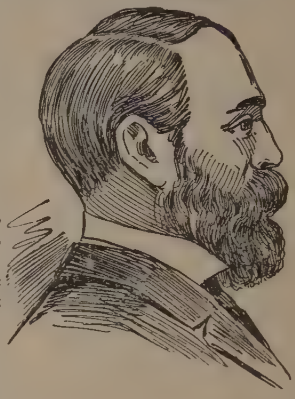
Diffrac'tion-Grating, an instrument for separating from one another light-waves of different lengths. A diffraction-grating is simply an instrument which, when placed in the path of a pencil of light, will impress a different direction upon each different color which is present in the pencil of light. A grating consists of a large series of very narrow, parallel apertures equidistant one from another. The light-waves, in passing through these apertures, are diffracted, and each wave-length is sent off in a different direction from every other wave-length. Just how this happens is too complicated for explanation in this brief sketch. Diffraction-gratings were devised by the distinguished German optician, Fraunhofer. He made them by winding fine wire about two parallel screws cut with fine threads. They are now made by ruling, with a diamond-point, a polished surface, such as glass or speculum metal. The unruled portion acts as an aperture for light, which is transmitted through the grating or reflected from its face. All the best gratings of the world have been made by the late Professor Henry A. Rowland of Johns Hopkins University. Most of his gratings are ruled on speculum-metal with 14,438 lines to the inch; but a few of them have been made with as high as 42,000 lines to the inch. The largest error in the position of any one of these lines is said to be less than one one-hundred-thousandth of an inch. The first thing absolutely essential for the manufacture of a good grating is the manufacture and adjustment of a perfect screw. The reader who desires to learn how such a screw is made should consult Professor Rowland's article on the screw in the *Encyc. Britannica.* For a thorough discussion of the diffraction-grating see Preston's *Theory of Light,* Chap. 9.

Diges'tion in plants is essentially the same process as in animals. It consists in producing such chemical changes in insoluble foods that they become soluble in water, and consequently fit for absorption or transfer; or, when already soluble, in reducing them to simpler forms. There are no special digestive organs in plants comparable to the alimentary canal of animals, with its connected glands; and likening the leaves to the stomach is misleading. Digestion is usually accomplished by the action of enzymes (which see) or ferments secreted by the living protoplasm. (See SECRETION.) In some cases these enzymes are produced in special glands; in others they are formed by the same cells that have other functions. Digestion often occurs outside the plant-body, as when the embryo secretes diastase (see ENZYMES) to digest the starch stored around it; or when a fungus digests the cellulose of a cell-wall which it is penetrating. Or digestion may occur within the plant-body, as when the starch stored in a potato-tuber is digested in order to be transferred to the growing regions, or the starch-granules formed in a leaf are digested to be carried away to places of use or storage.

Dijon (*dē'zhôn'*), the former capital of the old duchy of Burgundy and the chief city of the French department of Côte-d' Or, is situated on a plain at the foot of Mt. Afrique, 1,916 feet in height. It is an important place as a part of the inner line of French defenses, and the neighboring hills are crowned with strong forts. It is a well-built town, with broad streets and open squares, boulevards and beautiful surroundings. The Gothic cathedral, which dates from the 13th century, has a spire 301 feet high. Dijon, known to the Romans as Dibio, passed in the 5th century from Burgundy to France. In the 9th century it was ruled by its own counts. In 1007 it was united to the duchy of Burgundy and made its capital. It became French territory in 1479. It yielded to a German army in 1870. Population, 76,847.

Dike. See JETTY.

Dilke (*dĭlk*), **Rt. Hon. Sir Charles Wentworth,** an English statesman and author, was born at Chelsea, Sept. 4, 1843. He graduated at Cambridge, and was soon after called to the bar. He published in 1868 a description of his travels in the United States, Australia and New Zealand under the title, *Greater Britain.* He was elected to Parliament in 1868, was under-secretary for foreign affairs and also president of the local-government board under Gladstone. In 1886 his connection with a divorce case prevented his reëlection to Parliament, but his influence was still felt through his writings. His essays, collected under the title of *The Present Position of European Politics,* were first published in the *Fortnightly Review.* He has also published works on the British army, army-reform, imperial defense and the British empire and a work entitled *Problems of Greater Britain.* In 1892 he was again returned to Parliament.



SIR CHARLES DILKE

Dillon, John, Irish Nationalist member of Parliament and leader of what is known as the Plan of Campaign, was born at Dublin in 1851, and entered the British Parliament in 1880 as member for Tipperary and since 1885 has sat for East Mayo. He has suffered imprisonment twice (in 1881 and in 1891) for treasonable offenses. He at one time was a close ally of Parnell, and later actively opposed him. He succeeded Mr. Justin McCarthy in 1896 as leader of the Nationalists, and is known "for his intense religious fervor and his transparent sincerity," though neither political party in the House of Commons has cared to endorse his attitude as an Irish agitator.

JOHN DILLON, M. P.

Dinwid'die, Robert, governor of Virginia from 1752 to 1758, was born in Scotland about 1690. His rule as governor was not successful, his ill-temper and avarice making him very disagreeable to his subjects. He was the first to suggest the taxing of the colonies to the British board of trade. He discerned Washington's military ability, and made him adjutant-general of one of the four military districts of Virginia. He died in England in 1770.

Diocletian (*dī′ô-klē′shan*), **Valerius Diocletianus,** a Roman emperor, was born in Dalmatia in 245, and reigned from 284 to 305. He entered the army and held important commands under the Emperors Probus and Aurelian. After the death of Numerianus he was chosen to succeed him by the troops at Chalcedon. With his reign began a new form of government in Rome. He appointed Maximian as his companion in authority, styling him Augustus, and soon after he appointed Constantius Chlorus and Galerius as subordinate rulers, each with the title of Cæsar. Each of the four rulers had a different capital and governed a different region. In 305 Diocletian, being worn out by work, resigned his position as emperor and went to Salona, in Dalmatia, where he died eight years later. His reign has become memorable for the persecution of the Christians.

Diœcious Plants (*dɨ-ē′shŭs*). Those in which the staminate and pistillate flowers occur on different plants. See Dichogamy.

Diogenes (*dɨ-ŏj′ė-nēz*), a famous Greek philosopher, lived from about 412 to 323 B. C. He and his father were caught adulterating coins, and compelled to leave their native city of Sinope. He went to Athens, where he got rid of all of his dress and furniture, except his cloak and purse and a wooden bowl, because he believed the more things a man has the greater are his wants. He even threw away the bowl, when he saw a boy drinking from the hollow of his hand. He went to Cynosarges, where he lived in a cask, and in order to harden himself he used to roll in hot sand in summer, and in winter he embraced snow-covered statues. He afterward made a voyage and was captured by pirates, who sold him as a slave in Crete. His master took him to Corinth to conduct the education of his children, and he became famous there. Once Alexander the Great came to see him at Corinth and asked him if there was any favor he could do him. Diogenes replied that the only thing Alexander could do for him was not to stand between him and the sun. Alexander was so struck with his answer, that he is said to have cried: "If I were not Alexander, I would be Diogenes." Diogenes died at Corinth, and a pillar was erected to his memory.

Dionysius (*dī′ô-nĭsh′ĭ-ŭs*), **The Elder,** an ancient ruler of Syracuse in Sicily, was born about 430 B. C. When Sicily was invaded by the Carthaginians, he became a general in the service of Syracuse, which was then a republic. In the year 405, he made himself tyrant or ruler of Syracuse. He later continued the war against the Carthaginians, and was at first defeated, but afterward gained a complete victory. He also engaged in many other military expeditions, and was one of the most distinguished rulers of his time. Not content with his military renown, he wrote poems and tragedies, and at one time gained a prize at Athens for a work on tragic poetry. He died at Syracuse in 367 B. C.

Diplomatic Service, that branch of a government's service which has to do with political relations with other nations. It aims to secure between the home-nation and any other nation such understanding as will make for their independence, peace and mutual benefit, but particularly for advantages to the home-nation. The diplomatic serivce seeks to secure its ends without resort to force. It works for such agreements as treaties, alliances and trade-reciprocity. Its work is constructive and educational. The agents of the diplomatic service are (1) ambassadors, (2) ministers plenipotentiary and envoys extraordinary, (3) ministers resident, (4) *charges d' affaires* and (5) secretaries of legation and *attachés*. These agents and their order of ranking were agreed upon by the Congress of Vienna in 1814, and have been quite generally adhered to. These various agencies have developed from the early messenger-service between sovereigns and governments, and were inevitable because something must always be left to the good sense of the messenger. The early heralds or ambassadors carried special messages, but it finally became obvious that advantages would come from having a representative on the ground. The Congress of Westphalia, held in 1648, is usually regarded as the starting-point of diplomacy in the modern sense.

Dipper. See Bear, Greater and Lesser.

Directory, the name given to the executive department of the French republican government by the constitution of 1795. There were in France two legislative bodies like our senate and house of representatives. The directory was composed of five directors, elected by the upper legislative house, corresponding to our senate, from a list of names proposed by the lower body, which corresponded to our house of representatives. One of the number retired each year and a new one was elected. Under their management France was very successful in war, but they did not succeed in quieting internal disturbances, nor did they agree among themselves. Three of the directors, of whom Barras was the leader, managed to get the other two removed and new ones appointed. Many other such changes took place, Barras being the only one who remained a director during the four years the directory lasted. On Nov. 9, 1799, Napoleon succeeded in abolishing the directory, and practically became ruler of France, at first under the title of Consul.

Dismal Swamp, Great, a vast swamp in Virginia and North Carolina, about 30 miles long and 10 wide. The soil is black and spongy, and covered with stagnant pools during most of the year. In the center is Lake Drummond, 6 miles long and 3 wide, the surface of which is 21 feet above the level of tide-water. The swamp is covered with forests of cypress, juniper, gum and cedar, and in its drier parts with beech and oak. Two large canals run through it, on which are carried great quantities of lumber for shipbuilding, railroad-ties, shingles, etc. The great swamp and several smaller ones near were noted hiding-places for escaping slaves before 1865.

Disper'sion, as used in physics, is a phenomenon which occurs when a beam of light composed of different colors is made to pass through a prism or through a diffraction-grating. When a beam of sunlight falls on a glass-prism, we find that the red, yellow, green and blue rays are each refracted in different directions. Dispersion for any particular substance is measured in the following manner: Consider any ray of light which is deviated by the prism through an angle D, and another ray whose deviation is $D + dD$. Then

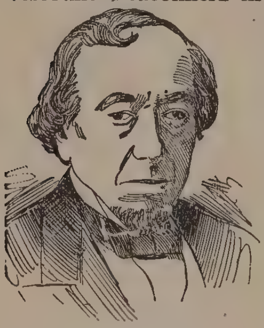
$$\text{Dispersion} = \frac{dD}{D.}$$

It may be shown that, in the case of a thin prism for which the refractive indices of the two rays differ by $d\mu$,

$$\frac{dD}{D} = \frac{d\mu}{\mu^{-1}},$$

and hence the dispersion is measured also by the fraction $\frac{d\mu}{\mu^{-1}}$.

The explanation of dispersion lies in the fact that in any one medium, except ether, light-waves of different lengths travel with different speeds.



BENJAMIN DISRAELI

Disraeli (*dĭz-rā'lĭ*), **Benjamin,** created Viscount Beaconfield in 1876, and a great English novelist, was born at London in 1804. He devoted himself for a time to literature and in 1826 published his first novel, *Vivian Grey*, which was quite popular. Others of his novels are *Contarini Fleming, Henrietta Temple, Coningsby, Sybil, Tancred, The Young Duke, Lothair* and *Endymion.* His works were widely read, because many of them accurately described real persons in the society of his time. In 1837 he was elected to Parliament. His first speech was a failure, the house refusing to listen to him; but as he sat down he said: "I shall sit down now, but the time will come when you will hear me." He gradually became noted as an opponent of Sir Robert Peel, and, after the death of Lord Bentinck in 1848, he became the leader of the protectionist party in the house of commons. In 1852 he was appointed chancellor of the exchequer in the ministry of Lord Derby, and accepted the same position in 1858 in the new Derby ministry. Once more, in 1866, he joined Lord Derby in his third ministry, and was the main author of the reform-bill, which became law in 1867 and gave the right to vote to nearly a million men who had not been able to vote under the old law. Disraeli became prime-minister in 1868, but was defeated in a vote on Gladstone's bill regarding the Irish established church, and resigned in the same year. In 1874 he once more became prime-minister, and was specially occupied with the foreign policy of the country. He resigned in 1880, and died at London on April 19, 1881. See his *Life*, by Hitchman; also monographs by Brandes, Kebbel and Froude. His father, Isaac, was a famous literary antiquarian, writing such interesting books as *Curiosities of Literature.*

Dissent'er. The term dissenter has come to have in English history a very definite meaning. It refers to those who dissent from the doctrines of the Church of England, and it emphasizes the view, not that they differ from the church and thus are heretical or schismatical, but that they differ from the sentiment of the English people as it is organized in that church. A dissenter, moreover, is one who is bold in declaring his difference or opinion and in acting accordingly. Burke, in his great speech on American conciliation, speaking of New England as "the dissidence of dissent," thereby signified the resolve of New England's people that in matters of principle and conscience they would not submit to the government of the nation. The dissenting spirit is often referred to under the term: the Nonconformist conscience. In general it has stood for a stricter code of morals than that which is current among the English aristocracy, for strict subservience to biblical teaching and for anti-imperialism. It has been accused of narrowness, of displaying more zeal than enlightenment and of applying abstract principles without regard to the facts of the case.

The earliest dissenters are the Lollards who in Richard II's reign attacked the immorality, worldliness and superstition of the Church of Rome; they came into conflict, thereby, with the national government in the reigns of Henry IV, V and VI. The typical dissenting spirit was aroused in the reign of Henry VIII by the translation and printing of the Bible by

Tindale. The persecutions suffered by the reformers were inflicted by the national and not merely by the clerical leaders. Throughout the Reformation we find men who dissented from the opinion then dominant in the councils of the nation, either going too far in their Protestantism or declining for conscience' sake to follow as far as the national government had gone. In 1558, on the ascension of Elizabeth to the throne, English Protestantism took virtually its present character, and the national church in its independence was firmly established. In 1563 the 39 articles of the English Church were made the test of conformity. Since then a dissenter is any Englishman who boldly asserts that those articles are not in conformity with the Bible and, therefore, are not to be accepted. As the reading of the Bible spread, the number of those who found cause for dissent increased and came to include all classes of people. These were known by the common name of Puritan; and they found their most perfect expression in the stern yet cultured mind of the poet, Milton, and in the fervor of the "inspired tinker," John Bunyan. It was dissenters who formed the backbone of the party that overthrew Charles I, and it was dissenters who established the colonies of New England and Pennsylvania. The extreme spirit of dissent is found in the Quakers. The Independents (Congregationalists), who included Cromwell, Milton and most of the great Puritans, upheld freedom of belief. The Presbyterians desired a national church and general conformity, but to the opinions which they held and not to those current in the Church of England.

The Independents have developed both into what are now the Baptist churches and into the Congregationalists. In 1730 the Congregationalists, Presbyterians and Baptists united for the protection of their civil and religious liberties, under the name of the Three Denominations. In 1739 John Wesley inaugurated the movement which rescued millions in England from the drunkenness and debauchery that were then sweeping the country, bringing them to the fold of the Christian church through the gates of Methodism. For the Church of England was then closed to all missionary zeal; and John Wesley was compelled to organize a separate church. Methodism not only added immense numbers to the ranks of dissenters, but it gave them renewed spirit. The Methodists are now the most numerous of English dissenters. They have been a powerful factor in giving England Sunday-schools and common schools.

The dissenters aided greatly in the expulsion of the Stuarts and in the establishing of a Protestant and constitutional monarchy under William III and his successors. Since the Church of England still possesses certain peculiar privileges, such as sending its bishops to the House of Lords, the dissenters are determined to secure the disestablishment of that church and the placing of all religions on an equality before the law.

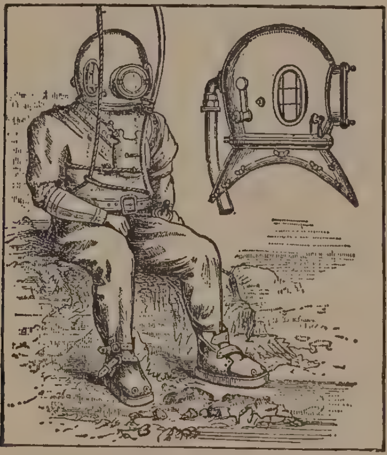
Distilla'tion, a process by which substances which are made into vapor at different degrees of heat are separated from each other, or those which can be made into vapor are separated from those which cannot. The usual method of distillation is by means of a covered boiler connected by a tube with a condenser. Suppose that it is wanted to separate two substances from each other, it being possible to heat one into vapor but not the other. The substance being put into the boiler and heated, that part which can be vaporized rises and passes through the tube at the top into the condenser, which is a box kept cool. The coolness of the condenser lowers the temperature of the vapor and it condenses into liquid, just as steam does on the inside of the cover of a kettle. This principle is used in preparing alcoholic liquors, the more easily vaporized parts of the fermented juice of fruits and grains being separated from the rest, in the form of alcohol, which keeps the flavor of the juice from which it is made.

District of Colum'bia, the territory containing the national capital (Washington City), is bounded on the north, northwest, east and southeast by Maryland and on the west and southwest by the Potomac River and Virginia. Its area is 60 square miles, though originally the area was 100 square miles. It was originally ceded to the United States by Maryland and Virginia in 1788 and 1789. The Virginian portion and the city of Alexandria were given back in 1846. Slavery was abolished in the District in 1862. The affairs of the District are now managed by three commissioners under the direction of Congress, and the citizens have no vote. Half of the District's expenses is paid by the general government, the other half being raised by taxation on the property of the citizens. There also are a court of the District of Columbia, with six judges, and a police-court with one judge. The climate is generally healthy, though fevers are somewhat common in summer. The soil is comparatively fertile and farms are numerous. Manufactures are not common, printing and publishing being the chief industry. Besides the public schools, there are many educational institutions of different sorts, most of which are in Washington. Among them are Georgetown College, Columbian University, Howard University, the Smithsonian Institution and the National Museum. Population, 331,069.

Diver, a water-bird, famous as a diver, commonly called the loon. It is found on both hemispheres, and during the breeding-season frequents ponds and lakes of fresh water, but after the breeding-season is over it seeks the seacoast and salt water. The webbed feet are remarkably far back on the body, and these birds are very awkward on the ground, but they are good flyers and unusually fine swimmers and swift divers. They are difficult to shoot. They are large, solitary birds, seldom more than one pair occupying a lake. The voice is loud and harsh. In June they lay two or three dark, olive-colored eggs in a rude depression in the ground near the water.

GREAT NORTHERN DIVER

Di'ving. The art of diving to great depths under the water to bring up pearls, corals and sponges has been practiced in the Indian seas from very early times. Stories are told of these divers remaining under water for from two to three minutes. In modern times mechanical arrangements of different kinds have been invented to enable divers to stay longer under water. The most important of these is the diving-bell. This was used in quite ancient times, but it was not until the 18th century that it was so improved as to be of any great value. It is a large bell of iron which sinks by its own weight. The air in the bell keeps the water from filling it, but the farther down the bell goes, the greater is the pressure of the water, so that the air in the bells is continually compressed into a smaller space. By attaching a rubber hose to the top of the bell and continually pumping air with a force-pump, the water is kept from rising in the bell. Inside of this bell, therefore, men can breathe and can search for pearls on the bottom of the sea or do anything else under water. Another apparatus used by the divers is the diving-dress or armor. It is an india-rubber suit, with a metal helmet, having pieces of glass in front to enable the diver to see. Lead soles are used for the shoes in order to make the diver sink. A tube is fastened to the helmet through which air is supplied by a force-pump at the surface, while superfluous air escapes through a valve in the face-plate. Other forms of diving-armor are also used. While going down through the water, the diver suffers from severe pain in the ears and over the eyes, but this stops as soon as he touches the bottom. Divers have been known to work at a depth of 201 feet; but 150 feet are as deep as it is safe to work.



DIVING-DRESS AND DIVING-HELMET

Dix, Dorothea Lynde, an American philanthropist and author, was born at Hampton, Me., April 4, 1802, and died at Trenton, N. J., July 19, 1887. She established a school for girls in Boston, and later gave much of her time to helping criminals, the insane and the poor. In 1834 she went to Europe to investigate the methods of treating these classes, and three years later visited nearly every state in the Union, her exertions being the means of establishing many state insane asylums. During the Civil War she was superintendent of hospital-nurses at Washington. She published several works, among them *The Garland of Flora* and *Prisons and Prison-Discipline.*

Dix, John Adams, an American soldier and politician, born at Boscawen, N. H., in 1798. He entered the army and became a captain in 1825, but soon resigned, studied law and settled in New York, soon becoming secretary of state for New York. In 1845 he was chosen to fill a vacancy in the United States senate, being a Democrat. In 1860 he was appointed secretary of the treasury, and it was he who issued the famous order to the commander of a revenue-cutter at New Orleans: "If any one attempts to haul down the American flag, shoot him on the spot." In 1861 he became major-general of volunteers, and later had command of an army corps. He was in command at New York in 1863 during the riots which then took place; and later had charge of the department of the east. In 1866 he became minister to France; and in 1870 he was elected governor of New York by the Republicans. He died at New York city, April 21, 1879.

MORGAN DIX

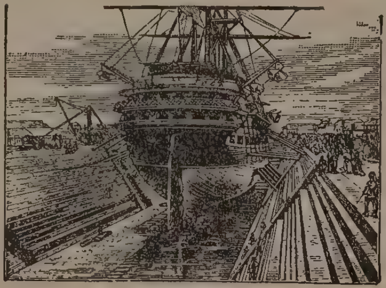
Dix, Morgan, American divine and author, was born at New York Nov. 1, 1827, the son of John A. Dix and Catherine Morgan. He was educated at Columbia College and the General Theological Seminary. For almost fifty-three years he was identified with Trinity Church, New York, of which he became assistant-minister in 1855 and rector in 1862. His activities were great as a churchman, and he also was an extensive author. Among his principal publications are *Commentaries on Romans* and on *Galatians and Colossians; The Calling of a Christian Woman; The Seven Deadly Sins; The Sacramental System;* and *Lectures on the First Prayer-Book of Edward VI.* His death occurred April 29, 1908.

Dix'ie, a name given to the southern states. The name is derived from the popular song which sings of the happiness of Dixie's Land; and it is said that this happy region was given its name of Dixie's Land by slaves, because of the kindness to his slaves of a man named Dixie.

Dnieper (*nē'pẽr*), a river of Russia and the most important river of Europe, next to the Volga and the Danube. It rises at the foot of Voldai Hills, in the government of Smolensk, flows south to Kiev, and finally into the Black Sea. It is about 1,200 miles long, and has several large tributaries, all of which are navigable; but, owing to many natural obstructions, it is not so important for commerce as it otherwise would be. The Russian government has greatly improved the course of the river by taking away many of the obstructions and by building canals around some of the cataracts. Canals connect the Dnieper by means of its tributaries with the Duna of Niemen and Bog, and thus join the Black and Baltic Seas. It passes through the richest provinces of Russia, and at Smolensk is covered with ice from November to April. There is a fine suspension bridge, half a mile long, at Kiev. The river was anciently known as the Borysthenes, and was thought to be the largest river in the world, except the Nile.

Dniester (*nēs'ter*), a river of Galicia, in eastern Europe, rises in the Carpathian Mountains and flows southeastward into Russia, entering the Black Sea about 30 miles south of Odessa. It is about 760 miles long, the chief towns on its banks being Mohileff, Bender and Akerman. Navigation is interrupted by falls between Yampol and Bender, though an artificial channel permits the passage of small boats. In February and June there are severe floods, often raising the level of the river 20 feet and causing great damage along its banks by the swiftness of its current.

Docks are basins for receiving ships, and are of two kinds, wet and dry. A wet dock is a basin in which ships load and unload their cargoes. Where the tides cause great changes in the level of the water, the dock is walled in and the water inside is thus kept at one level. Dry docks are of two kinds: the stationary dock and the floating dock. They are used in order to get at that part of ships which is under water, in order to mend them. The stationary or graving-dock, as it is sometimes called, is made of stone or timber, the sides rising in steps. The entrance is closed by gates, and after the ship has entered the dock the water is pumped out, leaving the ship resting on timbers arranged for that purpose. Floating docks are of various sorts, their object being to raise vessels out of the water. One of these, which may be given as an example, is made of iron in the form of a long box without ends. Inside are compartments filled with water, causing the whole to sink below the bottom of the ship, which is then towed on to it. The water is then pumped out of the compartments, thus allowing the dock to rise with the ship upon it. Among the finest wet docks are those at London, Liverpool, Havre, Antwerp and Brooklyn, N. Y. All ports of any size have dry docks. One of the most wonderful feats of navigation was the towing of the dry-dock *Dewey* from the United States to Manila *via* Suez Canal, in 1907. See *Harbors and Docks*, by L. F. Vernon-Harcourt.



DRY DOCK

Dodd'ridge, Philip, an English clergyman, was born at London in 1702. He studied theology at the Academy of Kibworth, and several years later took charge of the academy himself, moving it to Northampton, where he also was pastor. At this academy most of the Protestant ministers who dissented from the Church of England during the middle of the 18th century were educated. After managing the institution for 20 years, Dr. Doddridge sailed to Lisbon for the sake of his health; but died there soon after, in 1751. He wrote several works, especially *Rise and Progress of Religion in the Soul*, which were popular in his lifetime. See his *Correspondence and Diary*.

Dodge, Mary Abigail, an American author, born in Hamilton, Mass., about 1830. She was an instructor in the high-school at Hartford, Conn., and afterwards became a governess at Washington, D. C. She also wrote frequently for magazines under the name of Gail Hamilton, derived from the last syllable of her middle name and the name of her birthplace. She wrote several books, among them *Country Living and Country Thinking*, *Gala Days*, *Wool Gathering*, *Red Letter Days* and *A Battle of the Books*. She died in Massachusetts on Aug. 17, 1896.

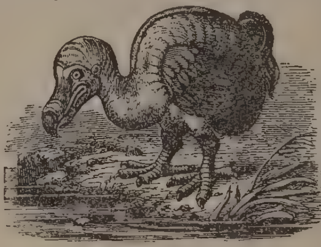
Dodge, Mary Mapes, an American writer for young people, was born at New York city in 1838. Her story of *Hans Brinker or the Silver Skates*, was very popular and gave her quite a reputation as a writer of stories. It was afterward published in England and France. She also wrote many magazine-articles and a book called *Rhymes and Jingles*. Two others of her books are *Donald and Dorothy* and *Along the Way* the latter a collection of poems For some time she was one of the editors of *Hearth and Home*, but became editor of *St. Nicholas* when it was founded, a position which she held until her death on Aug. 21, 1905.

Dodge, William Earl, an American philanthropist, was born at Hartford, Conn., in 1805. At 21 years of age he went into business in New York and became a successful importer and manufacturer. He was a member of many benevolent and religious societies; and was elected a Republican member of Congress in 1866-67. The Protestant college at Beirût, Syria, was founded largely through his help; and he always was very prominent in charitable work of different kinds. He died at New York in 1883.

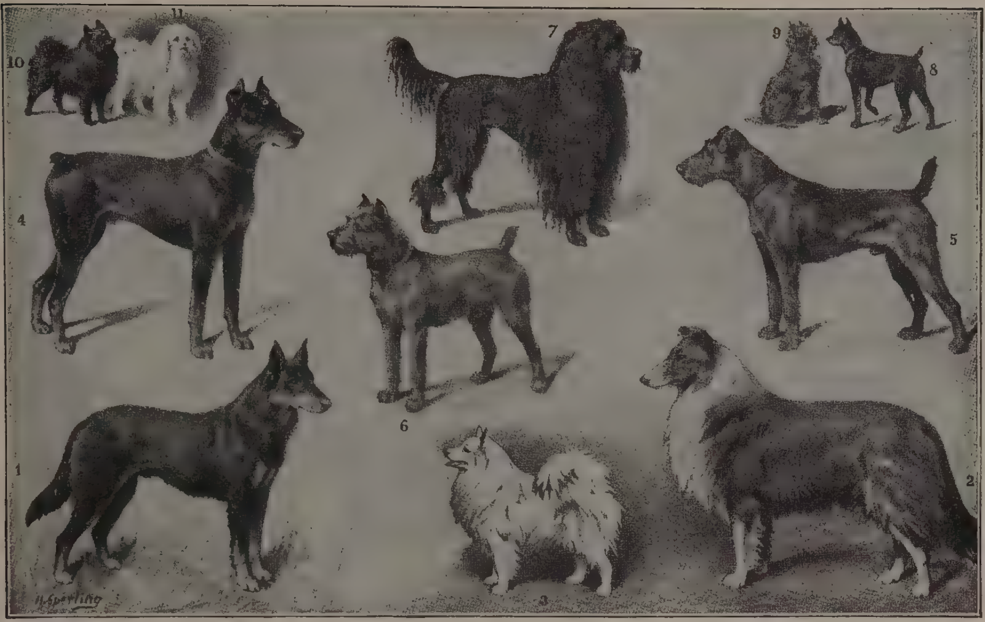
Dodge, William E., Jr., born 1832, is the son of the late William Earl Dodge. Mr. Dodge is director of the U. S. Steel Corporation, and is interested also in mining. He has wide and deep scientific interests; and takes a leading part in many benevolent enterprises. Mr. Dodge is president of the Evangelical Alliance and chairman of the International Committee on Arbitration. He is a member of the executive committee of the Metropolitan Museum of Art and of the New York Botanic Garden. He is also a member of the New York Academy of Sciences, the Linnæan Society of New York and the American Historical Association; and is vice-president of the American Museum of Natural History. Mr. Dodge is the donor of Earl Hall, the admirable social and religious center of student-life at Columbia, to Columbia University.

Dodgson, Charles Lutwidge, better known by his pseudonym of Lewis Carroll, an English clergyman, mathematical lecturer and writer, was born in Cheshire in 1832, and died in Surrey on Jan. 14, 1898. He wrote a number of mathematical works of considerable repute, but to English and American popular readers he is best known by his delightful Lewis Carroll books—*Alice's Adventures in Wonderland; Through the Looking Glass;* and *The Hunting of the Snark*. These works, with their amusing illustrations, are likely, as they deserve, to be of undying memory to little folks.

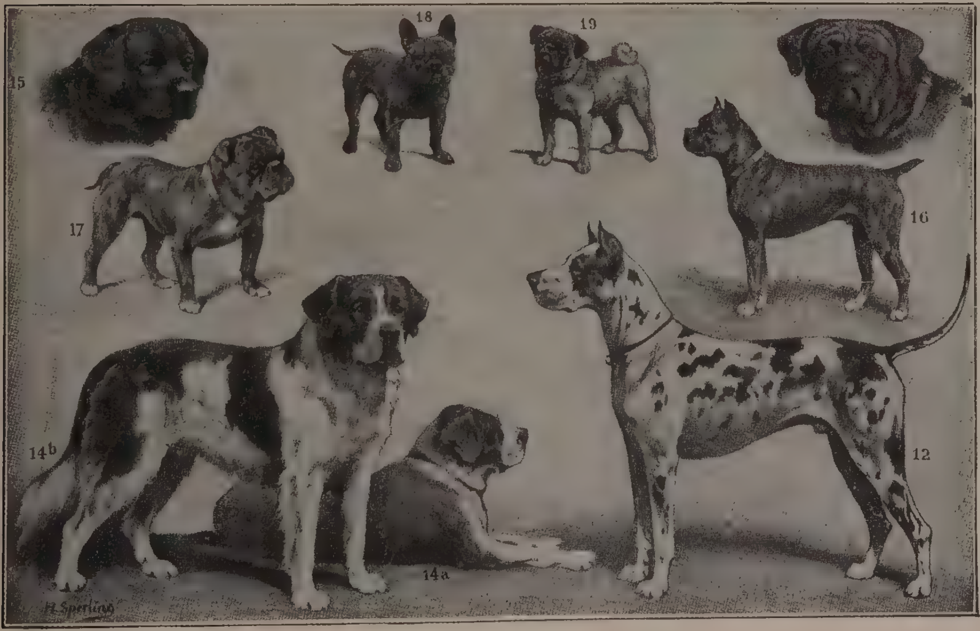
Dodo, a bird of curious and ungainly form, extinct since the close of the 17th century. The dodo was a large, clumsy bird weighing from forty to fifty pounds, found only on the islands of Mauritius, Bourbon and Rodrigues. By its structure it was related to the living pigeons. It had a round, fat body, a tail consisting of a few curly feathers, a large head and an enormous bill, the upper part of which was hooked over the lower. Having very imperfect wings, it was unable to fly and was killed by the sailors in large numbers for food. After dogs and hogs were introduced into the islands, about 1644, they began killing the young of the dodo and thereby hastened its extermination. A living dodo was in London in 1638, and was sketched by a number of artists.


DODO
(From painting in the Belvedere, Vienna.)

Dog, a domestic animal found among all peoples, civilized and uncivilized. Dogs were domesticated before historic times, the first animal domesticated by man. The dog was the only animal the North American Indians had tamed before the coming of white men. Their remains are found with those of man of the stone-age. The Egyptians, Greeks, Romans and earlier peoples all had dogs. It is likely that they are descended from wolves and jackals, but they were tamed so long ago that the parentage of the dog is uncertain. The dogs of uncivilized tribes are still close to the wild state, but the dogs themselves

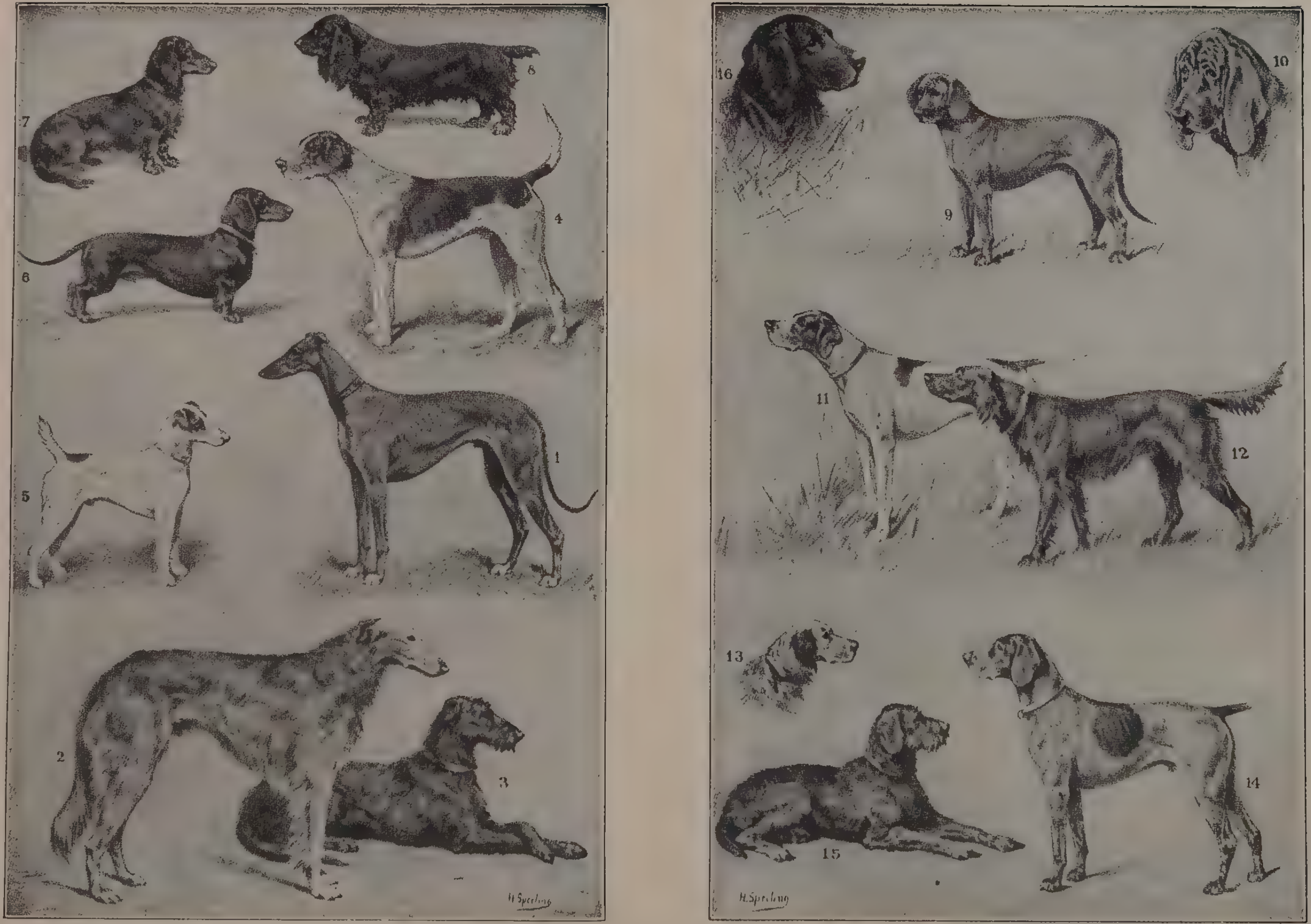


1 German Shepherd Dog 2 Scotch Collie 3 Spitz Dog 4 Doberman's Terrier 5 Airedale Terrier 6 Irish
Terrier 7 Poodle 8, 9 Smooth Haired and Shagged Pinchers 10 Dwarf Spitz 11 Maltese Dog



DOGS—Plate I

12 German Bulldog 13 Mastiff 14*a* Shorthaired 14*b* Long Haired St. Bernard 15 Newfoundland
16 Bull Terrier 17 English Bulldog 18 French Dwarf Bulldog 19 Pug Dog



DOGS—Plate II

1 Greyhound 2 Russian Hound 3 Scotch Hound 4 Fox Hound
5 Fox Terrier 6 and 7 Short and Longhaired Dachshund
8 Spaniel

9 Bloodhound 10 Bloodhound 11 Pointer 12 Irish Setter
13 English Setter 14, 15 and 16 Shorthaired, Wirehaired
and Longhaired Setters

become civilized in association with a higher grade of people. There now are many varieties, adapted to different purposes, that have been produced by breeding. The chief races of dogs are the wolf-dogs, the hounds, the spaniels, the mastiffs and the terriers. The lowest of the wolf-dogs are those of the Esquimaux, being little more than partly-tamed wolves, while the shepherd-dogs, which belong to the same race, are the most intelligent of all the breeds of dogs. The Scotch collie is one of the best of the sheep-dogs. The Newfoundland and the Great St. Bernard are usually classed with the wolf-dogs. The former seem to be descended from the wolf-dogs of Labrador, and, as their name implies, were imported from Newfoundland. They are expert swimmers, and have saved many children from drowning. The St. Bernards are large, powerful animals. They are kept by the monks of the monastery of St. Bernard, situated on one of the Alpine passes between Switzerland and Italy, and are trained to rescue travelers lost in the snow. By their keen scent they are able to find those that are lost and by loud barking attract the attention of the monks. The hounds make a large group. The bloodhound, a large, powerful animal, with a remarkably keen scent, is now rare, It was used to track criminals and to pursue fugitive warriors. It is said that Robert Bruce escaped from bloodhounds by walking a long distance in a stream of water, and then pulling himself out by an overhanging branch, thus breaking the scent. They were also used by the Spaniards in the conquest of Mexico and Peru. Those that were used in the south in the pursuit of runaway slaves were different from the Old World variety in having shorter ears and a more pointed nose.

The Siberian bloodhound is the dog called the Great Dane, and is now often seen as an imported variety in various parts of the United States. The staghound was a large, fleet animal, slimmer than the bloodhound. It was used in the chase of deer, but is rare now, as the stags of the forests of the Old World have become rare. The foxhound has taken the place of the staghound in England as a dog of the chase. Although smaller, by careful breeding it has reached a high degree of strength and swiftness. The harehound is smaller still, and is used in hare and rabbit hunting. The pointer is supposed to be descended from an old Spanish breed of the hound. It has been trained to stand, and point with its nose, when game is scented, and it, above all others, is the sportsman's dog. The ungainly *dachshund*, with its long body and short, crooked legs, is the German badger-dog. The greyhound stands in a class by itself and is not a true hound. The Irish and English varieties differ as to the quality of their hair. They hunt by sight, and have almost lost the power of scent. They are very slender and noted for speed. The spaniels make another race of dogs. Among them are the common spaniel, the water-spaniel and the setter. These are hunting-dogs, and the group also includes various fancy-pets. The mastiffs form still another race. They have a short broad nose, an enormous head with powerful jaws and a heavy body. The color of the common mastiff is usually buff. It is now used chiefly as a watch-dog, and is rarely met with in its pure form. The bull-dog and the pug belong to the mastiff race. The former is the fiercest of the domestic dogs. It has a thick bullethead and a scowling expression of the eyes. It is smaller than the mastiff, but very compactly built, and its color is usually brindled or black and white. It is the most brutal of the dogs, and when once its teeth are set it can scarcely be made to let go. The pug presents the appearance of a bull-dog on a small scale, but is timid and good-tempered. The terrier is one of the oldest dogs of Great Britain. It is a bold, active, intelligent little fellow, ordinarily of a black and tan color, with short hair, and is very successful in catching rats and other small animals. Other varieties are the Scotch terrier, the fox-terrier, the Skye terrier, the Irish terrier and the Airedale terrier The bull-terrier is a cross between the terrier and the bull-dog.

In Belgium the dog acts as the poor man's horse; singly, in pairs, by threes and fours, they are harnessed to carts, and often made to draw very heavy loads. In Alaska and parts of the far north the sledge-dog is a creature of prime importance; since the Klondike excitement every school-child has become familiar with the "huskies," without whose aid gold-seeker and explorer would be sadly handicapped. These dogs show marvelous endurance, and are able to draw light loads with great speed. The typical Eskimo dog very closely resembles the gray wolf in appearance, and is a mixture of good and bad qualities; both cowardly and courageous; is an irredeemable thief as regards food, but can abstain for a long time. He seems to take great pride in being of service, and in the sledge-train carries himself as if proud of his task. These dogs do not bark or bay like the civilized dog, their utterance being the wolf-howl.

The character of the dog as a pet might well be dwelt on; its faithfulness, unselfish devotion, courage, endurance, intelligence and docility. Though a favorite household associate, few know how to treat this companion and playfellow; as a rule it is overfed, and is neglected in the matter of cleanliness. Hodge in *Nature Study and*

Life proffers this brief advice: "For an adult dog one meal a day, given in the evening, is generally better than two or three. It should consist of dog-biscuit or the coarser table-scraps, bread-crusts, brown bread, oatmeal, bones with not too much meat and vegetables. In severe weather or with much exercise in the open air a dog needs to be fed oftener and to have more food. The best indication as to whether the feeding is proper is the condition of the animal. He should be neither lean nor fat, but *sleek*. One should be able to take up a handful of soft, loose skin anywhere on the dog's body. A gnawing-bone is the dog's tooth-brush, and he should be kept well-supplied at all times, both for business and amusement. Too much meat and a lack of cleanliness are apt to give rise to offensive odors, the 'doggy' smell of animals not properly cared for. Fleas are the great burden of a dog's life. To kill every flea on a dog it is necessary only to lather him completely with some mild, clean soap, let it stay on for two or three minutes, then rinse in clean water or let the dog take a swim." See *American Kennel and Sporting Dogs*, by Bruges; Watson's *Dog-Book;* and *The Dog in History and Folk-lore* (in *Sketches and Studies* by R. J. King).

Dog-Days is the name given in ancient times to the period of greatest heat in summer, because along the Mediterrenean this is of nearly the same duration as that in which the Dog-star rose at the same time with the sun. The joining of these two was supposed to have an evil influence on the earth. The period of the rising of the Dog-star with the sun is very indefinite and uncertain. In modern times dog-days are sometimes reckoned from July 24 to August 24, and sometimes from July 3 to August 11.

Doge's Palace, The. In Genoa as well as in Venice there is a palace once owned by the dukes or doges of the city; but while the former dates only from the 17th century and relatively is an insignificant building, the doge's palace at Venice still is a splendid and interesting structure, though it was begun in 1300. Between 800 and 1300 three or four palaces were built for the doges and destroyed. The present building was then started, facing the sea and bordering the Rio del Palazzo Canal. Friezes from the earlier building were inserted in the new one. This palace was some distance from the famous church of St. Mark, but slowly its front was so extended as at length to touch the church. Its rear lines the canal; and there is included an oblong court. The building is but three stories high. For an adequate account of its beauties one must study Ruskin's *Stones of Venice*, Vol. 2; but we may note a few points of interest. The exterior and interior have both suffered much from fire, from robbery by conquerors and from clumsy efforts to restore columns, statuary and paintings. But there remain the striking and unique façades, the beautiful marbles of the exterior walls and a profusion of delicate and elaborate sculpture, allegorical in character, presenting virtues, vices, the ages of man and similar subjects. On the third floor, in the great council-chambers, hang many splendid and famous paintings, including some by Tintoretto. The Bridge of Sighs, celebrated in poem and story, was built about 1590 to join the palace with the new prison then erected on the other side of the Rio del Palazzo. Of course its tragic fame arises from the shortness of the passage from the splendid abode of power to the dark and hopeless dungeons of the prison. But before 1590 the victims of the doge's authority had suffered under the floors of the palace itself. The fascination of the building can be understood only through study of the history of Venice and its institutions, which lent themselves so readily to extremes of splendor and misery.

Dog'fish, the common name for a group of small salt-water sharks and also for a fresh-water fish. The smooth dogfish without a spine and the spiny dogfish with a spine on each of the two dorsal fins are very abundant along the Atlantic coast. They are slate-color above and whitish below, and attain a length of about three feet. They are migratory, going into the southern waters in winter and returning north in the spring. Late in May and early in June they appear on the southern coast of Massachusetts, and work northward around Cape Cod and up to the coast of Maine. They are caught on hooks for the oil contained in their livers. When abundant, they are troublesome to the fishermen, eating their bait and driving away other fish. They carry from two to twelve eggs in oviducts, and the young are hatched within the body of the parent. The fresh-water dogfish (*amia*), often called the bowfin, belongs to the ganoids, a group of fishes with very hard, enamel-like scales.

DOGFISH

Dog-Star or **Sirius,** the brightest star in the heavens, belongs to the constellation of the Great Dog. Its light is estimated at six times as great as that of Vega or Arcturus. In ancient times it was described as of a reddish color, but its light now is white. The spectroscope shows that it is traveling away from us at a rapid rate and that its temperature is probably very much higher than that of our sun. From photometric measurements it appears that the light emitted by Sirius is probably 40 times as great as that emitted by our sun. For an interesting account of the color of Sirius see three articles by Professor See in *Astronomy and Astrophysics* for 1892.

It was discovered by Alvan G. Clark that Sirius is a double star having a very faint and close companion.

Dog'wood. Species of the genus *Cornus* which includes about 30 species, mostly in the temperate regions of the northern hemisphere. They usually are trees or shrubs, but sometimes herbs. The most showy species is the native *C. florida*, which is the flowering dogwood appearing in early spring. Its bark is said to contain the same substance as found in quinine. The wood is very hard and heavy, being used for tool-handles. The ordinary bush-forms, with red and greenish twigs and white, bluish or red berries, are common throughout the United States.

Dol'drums. The term doldrums probably is a latinized form of the word dull. In the early days of ocean-navigation it was applied to the regions near the equator where for months at a time there are intense heat and a dead calm, except for occasional squalls and light, very variable winds. These areas were dangerous to sailing-ships, especially until their exact location was known. Food and drink might give out before the vessel escaped from the calm. The area of doldrums moves north in July and south in January. In the Atlantic it moves between the equator and 10° north, in the Pacific between 15° south and 15° north. At any time the area covers about 5° of latitude. It is supposed that from these areas start both the tropical hurricanes and those currents of the ocean that flow from the equator to the poles.

A person who is in a depressed or sullen mood, with some tendency to gusts of temper, is said to be in the doldrums.

Döllinger (*dẽl'lĭng-ẽr*), **Johann Joseph Ignaz,** a German theologian, was born at Bamberg in 1799. At 24 his reputation as a writer led to his appointment as professor of church-history at the school of Aschaffenburg. Three years later he was appointed professor at the University of Munich. He became prominent in church-matters, and wrote several historical works, in all of which he upheld the authority of the pope. He was very prominent in the struggle which took place in the Roman Catholic church about the adoption, as a church doctrine, of the infallibility of the pope, belonging himself to that party of the Catholics, called the Old Catholics, who were opposed to it. Döllinger wrote a large number of works, many of them of great value. He died at Munich in 1890. Among his works are *Paganism and Judaism*, *The Church and the Churches*, *The Religion of Mohammed* and *The Reformation.*

Dolphin, the common name for a number of small whales, also called porpoises. They are not fishes, but mammals. They are dusky above and whitish below, and attain a length of six feet and more. The snout is prolonged into a slender beak, and the mouth is provided with teeth—an unusual thing among whales. They swim rapidly, and are often seen from the deck of ocean-steamers, swimming on the surface and leaping slightly from the water. The name dolphin is also applied by sailors to a true fish that changes its colors when taken from the water, and is on that account celebrated in literature.

COMMON DOLPHIN

Domatia (in plants). Minute shelters of various sorts formed usually upon the under side of leaves and used as dwelling-places by the mites. They are generally formed by hairs roofing over an angle of the veins, or sometimes by outgrowths, folds and pits.

Dome is usually understood to imply a round roof like an inverted bowl, though the shape is not always that of a bowl. Most of the great domes have an opening or eye at the top, on which stands a little dome, called a lantern. Until recent times they were always built of masonry—stone, brick or tiles—but wood is now often used, as in St. Paul's cathedral in London. The domes of St. Peter's at Rome and of the Florence cathedral are built of stone. The finest dome in America is that of the capitol at Washington. It is made of cast-iron, and has a statue of Liberty at the top. Many consider it superior to the dome of St. Peter's.

Domenichino (*dṓ-mĕn'ḗ-kē'nṓ*) or **Domenico Zampieri,** a celebrated Italian painter, was born at Bologna in 1581, the son of a shoemaker. He studied under several masters; and was known as a quiet, studious scholar, who never went into society except to study the faces of people in order that he might paint better. In Rome he painted for some of the prominent men of the time and gained a great reputation, but he excited so much jealous opposition among other painters that he left Rome for a time. He was recalled by Pope Gregory XV, who appointed him principal painter and architect to the papal palace. After 1631 he was in Naples where he opened a school; but he was persecuted by the painters of Naples who had formed the so-called cabal of Naples, to keep out all other painters. Their persecution is supposed to have caused his death, which occurred at Naples in 1641.

Domesday (or **Doomsday**) **Book,** the name given to an old record which contains a description of all the lands of England in the time of William the Conqueror. Commissioners were sent out by William, and were met wherever they went by representatives of the people, who told them the name of each estate or manor and the name of its owner; the amount of land, how much was wooded, how much was pasture, and how much meadow; how many mills and how many fishponds belonged to it; and the value of the whole in the time of Edward the Confessor as well as of William. The number of tenants on the land was also given, and the amount of their cattle and live stock, as well as the number of serfs. The king thus obtained a complete account of the wealth of the kingdom and of the military strength of each county in case of war. A record was also made of the lands the possession of which was in dispute. Domesday Book, thus, is now a valuable record for the study of the history of ancient England.

Domestic Art, a subject of study to which the attention of teachers has been directed principally during the last decade, is usually held to include the various household industries and such art-work as may be applied in the home. There, however, is no reason in the nature of the term, why all the branches of domestic economy, including cooking, hygiene, nursing, etc., should not be included under domestic art. At present it is customary to speak of the latter group of studies as *domestic science*, an unfortunate distinction of terms. Let us first consider domestic art in its narrowest conventional meaning. Its field is large still, including, as it does, the place of the household-arts in the development of society with reference not only to their present but to their primitive conditions and the process of their evolution. Domestic art takes into account the place of the work of women in society and the artistic and scientific preparation which is desirable for the due fulfilment of that work. A college-course in domestic-art may include such technical subjects as braiding, netting, basketry, weaving and sewing, with the attendant dyeing and cleansing of textiles, drafting, pattern-modeling, dress-making, millinery and embroidery. It may also include the development of household-manufactures, such as textiles, with their cultural and economic effects; household-art, economics, organization and management; and art-work, for the purpose of cultivating taste and skill in designing for these crafts. This list is taken from the course in domestic art at Teachers' College, New York, where fundamental courses in educational psychology, history and principles and allied courses in domestic science, English, geography, history, manual training and mathematics are also offered to students of domestic art.

Domestic science, which may be regarded as essentially one subject with domestic art, includes certain scientific studies in biology, physiology, hygiene and household chemistry; technical studies in the nature, production, manufacture and manipulation of foods; household-mechanics and sanitation, laundering, home-nursing and emergencies; and social and economic studies in history and household-art and economics. These studies should not obscure practical efficiency, but assist it. It is felt that domestic art and domestic science, as taught in elementary and secondary schools, may do much to improve social conditions and especially to educate foreigners into American habits and modes of life. For this reason it is apt to be one of the principal features of settlement-work; but its value is also widely recognized in elementary and grammar schools, secondary schools, normal schools and colleges.

Domestic Science. The same principles that led to the introduction of manual training into the American public schools for boys led to the institution of domestic-science departments for girls. We are at last learning the lesson that the common work of life may be done both scientifically and artistically and that thus the plane of our living may be greatly elevated.

In the manual-training high-schools of our larger cities domestic science (including domestic art) usually constitutes an important department. Some of the main branches taught under this heading are sewing, dressmaking, millinery, history of costume, drawing, household-design, cooking, dietetics, purchase of commodities, house-sanitation, laundry-work, general household-economics and the care of young children. Emphasis is placed upon a mastery of the underlying principles rather than upon the acquirement of mere skill in the practice of the art.

The opportunities in this line at the present time are very promising. Schools and colleges in many parts of the country are opening new departments of domestic science and calling for well-equipped teachers. There also is a growing demand for experts in dietetics in our hospitals and philanthropic institutions. A normal-school course in domestic science lasts three years, and includes educational subjects, such as psychology and the history of education, in addition to the regular technical work.

Many institutions in our large cities are now offering excellent courses in domestic science. A few of the most noteworthy are the Teachers' College, the Manhattan Trade-School for Girls and the Girls' Technical High-School in New York; Pratt Institute, Brooklyn; the Manual-Training High-School of Kansas City; Downer College, Milwaukee; the State College of Agriculture at Ames, Iowa; and the Minnesota Agricultural College.

Domingo, St. See HAITI and SAN DOMINGO.

Dominic, St., founder of the Dominican order of monks, was born at Colahorra, a village of old Castile, in 1170. At 15 he proceeded to the university at Palencio. The story is told that, while there, he sold his clothes to feed the poor in a time of famine. In 1204 Dominic first became prominent. He then went with the bishop of Osma on a journey to Denmark, and on the way came in contact with the Albigenses of southern France. The legates, whom the pope had sent for their conversion, failed, and were on their way back to Rome, when Dominic met them and with a few followers began the work which the legates had given up. The pope sent a crusading army into the country, and Dominic seems to have gone with it. After the crusade against the Albigenses Dominic formed a society of monks (see DOMINICANS), and in the course of five years the society spread all over Europe. Dominic died at Bologna in 1221.

Domin'icans, the name by which the disciples of St. Dominic became known. The order was founded in 1216. Its members took a vow to eat no meat, to wear no linen clothes, to fast and to preach continually. They also took the vow of absolute poverty and of obedience to their head; and went about preaching and teaching, begging their living as they went, and thus were often called the Begging Friars or Brothers. In England they were called the Black Friars on account of the black cloak they wore. They soon spread through Europe, and many of the greatest teachers and preachers of the middle ages belonged to the order. See *Life of St. Dominic* by Archbishop Alemany and *The Coming of the Friars* by Dr. Jessopp.

Domitian (*dô-mĭsh'ĭ-an*), **Titus Flavius Domitianus,** the third of the Flavian emperors of Rome, was born at Rome in 51 A. D. When his father, Vespasian, was declared emperor, Domitian was given the administration of Italy by the soldiers until his father's return from the east; but he so abused the power, that, when his father returned, he excluded Domitian from all share in public affairs; and during the rule of Titus, his brother, he still abjured public life and gave himself up to pleasure. On the death of Titus he was declared emperor by the soldiers, and began his rule by attempting a reform in morals and by passing many good laws. In war he was not successful, and was defeated by the Dacians. He became jealous of the better success of his general, Agricola, in Britain, and in consequence summoned him to Rome and probably had him killed by poison. In 93 a revolt of his soldiers on the upper Rhine caused him to become suspicious of everyone, and from that time he became very cruel, great numbers of prominent men being put to death. He was murdered at Rome in 96. It perhaps was in his reign that John the Apostle was banished to Patmos.

Don, a large river in European Russia. It rises in Lake Ivan and flows generally in a southerly direction until it empties into the Sea of Azov, 1,325 miles distant. In some places the river has a width of 1,800 feet. Navigation is bad, except during May and April, when the water is high; and the river is usually closed with ice from November or December to March or April. It is visited in the lower part by two floods each year—one called the cold water, being caused by the melting of the snow along the lower half of its course; the other called the warm water, being caused by the melting of the snow near the upper part of the river. A canal connects the Don with the Volga.

Donatello (*dŏn'ȧ-tĕl'lō*) or **Donato,** a distinguished Italian sculptor, was born at Florence in 1386. He learned the goldsmith's trade, which then included all kinds of work in bronze, such as the making of statues, but later he became a sculptor and also a painter. One of his first achievements in sculpture was the statue of St. Mark at the Church of St. Michele in Florence, and it also is one of his best. Others of his great works are *The Baptist*, *David*, *Judith* and *St. George*. The chief man in Florence, Cosmo dei Medici, was his friend and patron. Donatello was a hard worker; 40 examples of his art now exist, there being many more thought to be his, but not certainly known to be so. He died at Florence in 1466. The name also is that of the hero of Hawthorne's *Marble Faun*.

Don'elson, Fort, an historic post in Tennessee on the Cumberland River, 12 miles east of Fort Henry. It was strongly fortified by the Confederates during the Civil War, and in 1862, when held by General Floyd with 15,000 troops, was attacked by Commodore Foote, who was driven back. But the forces of General Grant, coming up from the capture of Fort Henry, defeated the Confederate force, which came out of the fort to meet them. General Floyd and a part of his force escaped during the night, and the following day General Buckner, who was next in command, surrendered with about 14,000 men.

Don Giovanni is an *opéra bouffe* in two acts whose words are by Da Ponte and the music by Mozart. First produced at Prague, Oct. 29, 1787, and then in London at King's Theater, April 12, 1817, it met with extraordinary success. In one respect this opera is preeminent: All its moods and situations are essentially musical. "There is scarcely a feeling known to humanity which is not expressed in some one of the situations or characters." The overture was not begun until the evening before the first representation of the opera,—an extraordinary instance of rapid composition.

Donizetti (*dō̇'nē̇-dzĕt'tē̇*), **Gaetano,** an Italian musical composer, was born in 1797. He studied music under several masters, but when 20 years old entered the army. While garrisoned at Venice, he produced his first opera, and soon afterward, obtaining his discharge from the army, he devoted himself to opera-writing. He went to Paris, where his pieces were not very successful; but after gaining much applause at Naples he returned to Paris, and soon gained a great reputation. He received appointments at Naples and the court of Vienna; but a disease, brought on by overwork, affected his mind and he died in 1848. His masterpiece was *La Favorita;* others of his works are *The Daughter of the Regiment, Linda di Chamounix, Don Pasquale* and *The Martyrs.*

Dooley, Mr. See DUNNE, F. P.

Don Juan (*jū'an* Sp. *dōn hŏŏ-än*), a mythical person, the story of whom originated in Spain and spread throughout most of the countries of Europe. According to tradition, Don Juan belonged to a prominent Spanish family in the time of Peter the Cruel, and lived a life of wild dissipation. In trying to carry off the daughter of the governor of Seville, he was met by her father, whom he killed. He afterward went to the town where the governor was buried, and challenged his statue to follow him to supper. The invitation was accepted, and after supper the statue carried Don Juan to Hades. To this story others of a similar kind were added at different times, Don Juan always being a villain, whose evil life made him laugh at spiritual things. The story was made the plot for plays by Spanish dramatists, and was afterward made the basis of dramas and operas in several countries of Europe. The story, in one form or another, is also to be found in many poems and novels.

Donkey. See ASS.

Don Quixote. See CERVANTES SAAVEDRA.

Dora d'Istria. See KOLTSOF-MASALSKI, PRINCESS.

Dorcas. (1) A gazelle, with long, slender horns, found in Syria and the Sahara. (2) A woman, mentioned in *Acts* ix:39, who made coats and garments for the poor, and was lamented by the widows. (3) Hence, benevolent societies of women who have banded themselves together, usually in connection with a church, to provide clothing for the poor.

Doré (*dō̇'rā̇'*), **Paul Gustave,** a French painter and designer, was born at Strassburg in 1833. His first success was in landscape-painting, but he soon after began designing illustrations for books. He illustrated an edition of *Rabelais* in 1854 and the legend of the *Wandering Jew* in 1856. These works increased his reputation, and he soon after illustrated a work of Balzac and also drew many of the illustrations for a French journal. Other works which he illustrated are *Don Quixote*, Taine's *Travels in the Pyrenees, Fables* of La Fontaine; Milton's *Paradise Lost, History of the Crusades* and Dante's *Works.* He also painted a number of pictures, but is best known as a designer. He died at Paris, Jan. 23, 1883. See *Life* by Miss Roosevelt.

GUSTAVE DORÉ

Doremus, Sarah Platt, born at New York in 1802, was noted for her efforts in missions. She was of great assistance in the mission to the French peasants of Canada, and soon after became prominent in work for females in the New York city-prison. She was prominent in the relief of the sufferers from famine in Ireland in 1849, and in 1855 she helped to organize the Woman's Hospital Association. Her labors in behalf of the sick and wounded soldiers during the Civil War entitle her to remembrance. She died at New York in 1877.

Doria (*dō̆'rē-ă*), **Andrea,** a famous Genoese admiral, was born in 1468. He belonged to a noble family, and adopted military life. In middle life he entered the service of Francis I of France, who gave him command of his fleet in the Mediterranean, and in 1524 he defeated the fleet of Emperor Charles V near Marseilles. Objecting to some of the plans of Francis, he retired from his service and entered that of Charles and delivered his own city, Genoa, from the French. Instead of making himself sovereign in his own country, he helped the citizens to form a constitution and a republican government that existed until 1815. He was called the Father and Liberator of his Country. He afterward engaged in an expedition against the Turks, and also aided Charles V in the conquest of Tunis. He died at Genoa in 1560. See *The Conspiracy of Fieschi* by Celesia.

Dorians, one of the two foremost races of the ancient Greeks, the other being the Ionians. They claimed to be descended from Dorus, a son of Hellen, and settled in the Peloponnesus. They founded Sparta, Argos and Messenia. Their colonies were planted in Crete, Cyrenaica, Sicily and Asia Minor. The Dorians differed from the Ionians in their simplicity of life and stern and rough but solid character, which showed itself in their manners, laws and dialect as well as in the unadorned simplicity of their architecture. The Ionians, on the other hand, were noticeable for their eloquence and delicacy of taste and for their love of luxury.

Doric Order. See ARCHITECTURE and GREEK ARCHITECTURE.

Dorion, Sir Antoine Aime, Canadian statesman and jurist, was born in the province of Quebec in 1818, and died at Montreal, May 31, 1891. Educated at Nicolet College, he early studied law and in 1842 was admitted to the bar. From 1854 to 1861 he represented Montreal in the old Canadian Assembly, and Hochelaga he represented up to the era of Confederation in 1867. In the Dominion legislature he sat for five years, and was then elevated to the bench of Lower Canada (Quebec province), becoming chief-justice, with a seat in the privy council. He was knighted in 1877. Sir Antoine was in politics a Canadian Liberal, and leader of the French-Canadian *Rouge* party.

Dormouse, a small animal of squirrel-like habits, confined to the Old World. It is related both to the mice and the squirrels, but in structure is intermediate between them. It lives in trees and bushes, feeding on nuts and berries, and sits erect on its haunches like a squirrel when eating. It lays up a store of food for winter, and when cold weather comes it curls up in its nest and sleeps. On warm days it is likely to wake, eat and fall asleep again. Its name signifies the sleeping mouse. Dormice are tamed and kept as pets. In the United States the common white-footed mouse is often called dormouse.

DORMOUSE

Dorr, Thomas Wilson, was born at Providence, R. I, in 1805. Under the old charter of Rhode Island, only men who had a certain amount of real estate, and their eldest sons, had the right to vote. In 1841 the party in favor of general suffrage formed a new constitution, and chose Mr. Dorr as governor. The government of the state, which was chosen according to the old charter, resisted, and Dorr was arrested, convicted of treason and sentenced to imprisonment, but was pardoned in 1847. He died at Providence, Rhode Island, in 1854.

Dorsiven'tral Habit (in plants), the habit in plant-bodies which exposes two surfaces to different conditions. For example, in a liverwort one side of the body rests upon the soil or some other substratum, and the other is exposed to the light. As a result the two surfaces develop very much unlike. Ordinary leaves are dorsiventral, one surface being directed upward, the other toward the ground. The contrasting term is radial, in which all sides of an organ are exposed alike, as in an erect stem.

Dortmund (*dôrt'mo͝ont*), a town of Germany in the Prussian province of Westphalia, about 50 miles northeast of Cologne. Near it are many coal-mines, in which several thousand persons are employed. Iron-ore also abounds, and many forges and blast-furnaces have been built. The manufactures include tobacco, iron, steel, machinery, porcelain, oil, flour and woolen, linen and cotton-fabrics. There is a large number of breweries Among the chief buildings are the large railway-station and the old historic churches. During the middle ages Dortmund was a free town, having its own government. Population, 175,577.

Douglas, a thrifty city in Cochise County, Arizona, in which two of the great smelters of the country are located. There is but one smelter in the world larger than the Copper Queen at Douglas, and the Calumet and Arizona follows closely in its output. In one year these two smelters produced 15% of the entire copper-output of the world. The ore is supplied from mines surrounding the city, but principally from Bisbee. These smelters give employment to 2,000 people, and besides copper they produced gold, silver, lead and other minerals. Other industries are a large cement-plaster works, a brewery and a stone-quarry. Douglas has a fine system of public schools, several churches, a Y. M. C. A. building and an excellent library, which was presented by the Copper Queen Company. Douglas has gas and water-works, an electric light and power-plant, electric street-railways and the service of the El Paso and Southwestern Railroad. Population, 6,437.

Doug'las, an ancient noble family of Scotland whose family annals date from the time of William de Douglas, who lived about 1175–1213. From him was descended "the good Sir James," who fought with Bruce at Bannockburn, and, after Bruce's death, fulfilled his last request, to carry his heart to the Holy Land. William Douglas, Earl of Liddesdale, and Sir William Douglas, descended from "the good Sir James," were among the most famous warriors of their time. Other members of the family obtained the earldoms of Angus and Morton. The power of the family was once so great that it was commonly said: "No man may touch a Douglas or a Douglas' man; for if he does he is sure to come by the worse." The family continually engaged in feuds and warfare on the border, especially with the Percy family. A famous member of the family was Archibald, called Bell the Cat. At a meeting of nobles who were debating about a plan to get rid of one of the king's favorites and considering who should do it, he started up, exclaiming: "I will bell the cat." He tried to persuade King James IV not to make the invasion of England, which ended in the battle of Flodden; and soon after the great defeat he died heartbroken. The Douglas family is now represented by the earls of Selkirk.

Douglas, Stephen Arnold, an American statesman, was born at Brandon, Vermont, in 1813. His early youth was one of poverty; but he managed to spend three years at Canandaigua Academy, having the study of law in view. In 1833 he went west and settled in Jacksonville, Ill., where he entered on the practice of law and was so successful that he was chosen attorney-general of the state. He soon after was elected to the legislature, and in 1840 became secretary of state for Illinois. He was judge of the Illinois supreme court from 1841 to 1843, when he resigned and was chosen to Congress as a Democrat; and there he at once became recognized as one of the ablest men of his party. He strongly urged the admission of Texas into the Union, and supported President Polk in the War with Mexico. He was opposed o slavery; but believed that Congress did not have the right to restrict it to any part of the country. Hence he was strongly opposed to the celebrated Wilmot Proviso, which was intended to prohibit slavery in any territory that might be gained from Mexico in a treaty of peace. On the question of permitting slavery in the territories Douglas argued that the people who had settled in any particular territory should decide for themselves. This was the origin of the expression: Squatter Sovereignty. Douglas was elected to the senate in 1847, and in 1854 he introduced the Kansas-Nebraska bill, which provided that their own citizens should determine whether these territories should become free or slave-states. In 1860 the Democratic party split into two divisions, one of which nominated Douglas for president, and the other John C. Breckenridge. The ensuing election resulted in favor of Lincoln. Douglas was strongly opposed to secession, and delivered several addresses on the subject after the outbreak of the Civil War. He died at Chicago, on June 3, 1861. See *Life of Douglas* by Sheehan and *Life* by Flint.

FREDERICK DOUGLASS

Douglass, Frederick, an American orator and journalist, once a slave, was born near Easton, Md., about 1817. He ran away from his master in 1838, and took up his residence at New Bedford, Mass. In 1841 he began to lecture against slavery, and became well-known as an orator. In 1845 he published an account of his life, and later went to England, where he lectured eloquently against slavery to large audiences. In 1847 he published a journal at Rochester, N. Y. When the war broke out, he urged the employment of colored troops and helped to organize regiments of them. In 1870 he became editor of the *New National Era* at Washington. He was appointed minister to Haiti by President Harrison. See his *Life and Times* by himself. He died on Feb. 20, 1895.

Doukhobors. See DUKHOBORS.

Douma. See DUMA.

Douro (*dōō'rō*), a large river of Spain and Portugal. It rises on the frontier of the province of Soria, and flows in a westerly direction until it empties into the Atlantic near Oporto. It is 500 miles long; but navigation is difficult because of rocks and sandbanks, and it is little used for commerce. It has many tributaries, the most important being the Pisuerga.

Douw or **Dow, Gerhard,** a celebrated Dutch painter, was born at Leyden in 1613. He learned the art of glass-painting, and afterward became a pupil of Rembrandt for some years. He became for a time a portrait-painter, but was slow at his work and had trouble in getting anyone to sit for him. He was very exact in every detail in his paintings, it being said that he spent five days painting a hand, and his work was so fine that he had to make his own brushes. His best works are *The Dropsical Women*, *The Evening School* and *The Village Grocer's Wife*. He died in 1675.

Dove, a name commonly given to small varieties of pigeons, but no clear distinction can be made between doves and pigeons.

Do'ver, the capital of Delaware, and county-seat of Kent County, is about nine miles west of Delaware Bay. It has a state-house and a large state-library. There also are fruit-packing and evaporating-houses, flour-mills, glass, carriage and other manufactories. It is the center of a large fruit-growing district. Population, 3,720.

Dover, a port of England 70 miles from London, on the southeast coast of Kent, on the Strait of Dover. It is 21 miles from the French coast, and is the English seaport nearest to France. It lies in a low valley or basin between high chalk-cliffs, and is guarded by Dover Castle, which is built on the heights east of the town. The town is said to have been founded by the Romans. Elaborate fortifications are also built on the height to the west. Dover is the chief port which connects England and France, and steamers run daily from it to Boulogne and Calais. The city has many relics of ancient times, among which are several old churches. It has a salubrious climate, and is frequented as a health resort. The total tonnage, entered and cleared in 1910, was 3,665,705 tons. Population, 35,000.

Dover, N. H., a city of southeastern New Hampshire, close to the Maine boundary and about 12 miles northwest of Portsmouth. It is the county-seat of Strafford County and is situated on Cocheco River, from the falls of which it derives its water-power. Being founded in 1623, it is one of the oldest towns in the state. Its site is hilly. It possesses good schools, churches and an excellent public library. It has a number of cotton-mills and print-works, besides manufactories of woolen cloths, flannels, shoes, oil-cloth, hats, caps, sand-paper and glue. Population, 13,247.

Dover, Strait of, the channel which separates England from France and joins the English Channel with the North Sea. It is bordered by chalk-cliffs on the English side, and they also occur in places on the French coast. At the narrowest point its width is 21 and its length 24 miles.

Dow, Neal (1804-97), to whom is due the prohibition-law of Maine, was born at Portland in that state. He was famous as a temperance-orator and the founder of temperance-societies in Canada and England as well as in the United States. He fought in the Civil War, and for the greater part of a year was a prisoner in the hands of the Confederates. In 1880 he was the prohibitionist candidate for the presidency.

Dowden, Edward, LL. D., D. C. L., an Anglo-Irish critic, man-of-letters and professor of English literature at Trinity College, Dublin, was born at Cork, May 3, 1843, and educated at Dublin University. He was one of the commissioners of national education in Ireland. His literary industry was very great, for he was author not only of the best *Life of Shelley* extant, but of perhaps one of the most informing as well as critical works on Shakespeare, as to whose works he was an accomplished scholar and editor. His other works embrace a *Life of Southey*, and editions of Southey's, Wordsworth's and Shelley's poetical works; *New Studies in Literature;* and a *History of French Literature.* He died in Dublin, April 4, 1913.

Dowling, The Right Reverend Thomas J., was born in Ireland in 1840, but was educated at St. Michael's College, Toronto. He was parish-priest at Paris, Ontario, for 22 years, administrator of the diocese of Hamilton in 1883, bishop of Peterboro in 1887, and was transferred to the bishopric of Hamilton in 1889.

A. CONAN DOYLE

Doyle, Sir Arthur Conan, British novelist and physician, was born at Edinburgh, Scotland, May 22, 1859, and was educated at Stonyhurst, in Germany and at Edinburgh University, where he studied medicine, graduating in 1881 and taking his M. D. degree in 1885. While practicing at Southsea, he began to write for *Chamber's Journal* and other periodicals. He then essayed fiction at some length and published *A Study in Scarlet*, *Micah Clarke*, *The Sign of the Four* and *The White Company*. The success of these novels led to Dr. Doyle's abandoning medicine professionally. He then produced a clever series of detective stories, *The Adventures of Sherlock Holmes*, after which appeared *The Exploits of Brigadier Gerard*, *The Tragedy of the Korosko* and other tales. He has also written verse and a play, *A Story of Waterloo*, which was successfully staged by Sir Henry Irving. Dr. Doyle has been a great traveler. When he visited South Africa and the scenes of the struggles between Britain and the Dutch burghers, the result was a work entitled *The Boer War.* He was knighted in 1902.

Draco (*drā'kō*), a Greek legislator and the author of Athens' first code of laws, was born about 621 B. C. He probably simply put in writing the laws which were customary in his time; but these laws seem harsh and cruel to people of later times. Draco has had to bear the blame of their severity. His laws ordered how a child must be brought up from its birth, and educated, and what his duties were when he became a man. Plutarch says that death was the penalty for nearly every crime. The writing of the laws was probably intended to prevent the archons, who were at the head of the government, from abusing the rights of the people. Nothing is known of Draco's life.

Draft=Riots. These riots resulted from the enforcement of the conscription act, passed March 3, 1863, to fill up the ranks of the army, which was no longer adequately supplied by volunteers or by the state-drafts. Congress divided the north into enrolment-districts, each under the charge of a provost-marshal; he in turn was responsible to the provost-marshal-general, an officer of the war-department. By this act all "able-bodied male citizens of the United States" and foreigners intending to become citizens, between the ages of 20 and 45, were enrolled and became liable to three years' military service. There had been riots in Pennsylvania and Wisconsin over state-drafts, but the most serious were those in New York City. On Monday, July 13, 1863, after the lots had been drawn for about half an hour, a mob of some thousand men began to hurl brickbats and paving-stones into the marshal's office. The crowd increased, the drafting-office was destroyed, and the building fired. The few soldiers available were routed, and the police overpowered. Other draft-offices were set on fire, and the firemen prevented from putting out the blaze. Other houses then were burned, belonging to people whom the crowd thought responsible for the war and the draft. Then, as the crowd grew larger and fiercer, it seized upon many negroes, cruelly beat them, and in many cases killed them, burning the bodies. For one night New York City was practically at the mercy of the mob. On Tuesday, July 15, thieves joined the mob, and matters became worse. Governor Seymour addressed them from the City Hall in a weak speech. Towards evening about 800 troops joined the weary police, and some headway was made. On Wednesday it was announced that the draft had been suspended in New York City and Brooklyn. The mob subsided. Militia at the same time arrived and began to rake the streets with cannon wherever occasion offered. By Friday all rioting was at an end. About 1,000 were killed, chiefly members of the mobs. The damage to property was about $1,500,000.

Drago Doctrine. A theory advanced in 1902 by Dr. Luis Drago, Argentine minister of public affairs, as an extension of the Monroe doctrine, to the effect that the debts of a nation should not be collected by its creditor-nation by force. It was modified in 1907 to the effect that the claims should be argued through the courts of the debtor country up to the Hague Tribunal, whose decision, if unfulfilled, may permit of such forcible measures. Dr. Drago published his theory at the time when England and Germany were trying to exact their dues from Venezuela. It was not received very favorably at first, but was finally submitted to the Hague Conference for approval and adoption.

Dragon, the name given to a lizard found in the East Indies, about seven or eight inches long. The skin along the sides of the body, between the legs, is spread out into a kind of parachute, and, these animals, which live among trees, may be seen shooting through the space from tree to tree, with the parachute expanded. They feed upon insects. Their color corresponds pretty well to that of the bark of the trees, but they have little or no power of changing color. In ancient and medieval times the dragon was a fabulous monster, either a serpent or a hideous winged and clawed creature, guarding some treasure or spreading havoc by occasional visits, and against which gods, heroes and knights combated.

DRAGON

Dragon=Fly, the name of a group of insects, common all over the world, with four large transparent wings, that are net-veined. There are several varieties, and some have bright metallic colors. In the United States they are commonly called darning-needles, and are said by children to be able to sting, sew up the ears or do some other physical harm; but they have no sting and are entirely harmless to man. They have very large, rounded eyes, composed of several thousand elements united, and this gives a huge size to the head. Their mouth-parts are strong-biting jaws, and they devour many insects which they catch while on the wing. They are abundant about ponds and still waters, in which their eggs are laid. The larva lives in the water, feeding on insects and very small fish, which are caught by a peculiar claw. When ready to transform, the nymph crawls out of the water on the stem of a water-plant, its outer case splits open along the back, and the perfect insect issues from it.

DRAGON-FLY

Drainage, the means of escape for free water of the soil, which are (1) that afforded by the slope of the land, which may carry off much of the rainfall before it can sink into the ground, and (2) that given by underground facilities. On rather level land the excess water not absorbed by the soil itself tends to sink until it meets an impervious layer, and to spread on this until it escapes through some hillside as springs. If there is no such escape, the water remains as an underground lake saturating the soil to a level more or less below the surface. This level or water-table tends to rise according to the wetness of the season, and to fall with the dryness, or proportionably to the facilities for escape by artificial drainage. If the water-table is too near the surface, the air necessary for plant-roots is excluded from the soil. This tends to make roots, as, for instance, of grains, spread out in the upper layer of earth instead of striking deep. If the district is later subjected to drouth, the plant fails of its water-supply as the water-table descends below the layer of soil occupied by the roots. Artificial drainage is accomplished (1) by open ditches or (2) by covered drains. Shallow surface-drains, made by plowing, serve to carry off only surface-water. Dug ditches may also serve as outlets for covered drains. Covered or under drains are made by placing large stones, poles, brush or tiles at the bottom of a trench and covering with soil. They are made from 25 feet apart in heavy soils to 200 feet apart in light soils, and from three to four feet deep, the depth increasing with the distance between the drains. Tiles are made of clay, burnt like brick, are hollow and more or less cylindrical. They are more lasting than wood and more cheaply laid than stones, unless the latter are in the field and have to be gotten out of the way. The benefits of under-drainage are these: (1) By removing the free water to a lower level, the soil occupied by capillary water (see CAPILLARITY) is deeper, and more soil is available for plant roots. (2) Soil can more readily absorb rain-water and prevent surface-wash. (3) It aids ventilation of the soil, and so aids it in warming earlier in the spring and later in the fall. (4) It allows fertilizers to be carried into the soil instead of being washed off when the land has a slope. (5) It aids in various useful chemical changes. See King, *The Soil.*

Drainage-Canal. See CANALS.

Drake, Sir Francis, a celebrated English sailor, was born in Devonshire, probably about 1540, though some authorities give the date of his birth as 1539. He was educated by his uncle, Sir John Hawkins, and was brought up to a sea-faring life. At 20 he made a voyage to Guinea, and two years later he was captain of the *Judith* in the expedition of Hawkins to Mexico. When he came back to England, he had gained a great reputation, but had lost all he had invested in the expedition. Soon after, he plundered many of the Spanish settlements in South America, and marched across the Isthmus of Panama, where, by climbing a high tree, he saw the waters of the Pacific. In 1577, under the favor of Queen Elizabeth, he set out with five vessels, intending to pass through the Straits of Magellan and explore the waters he had seen from the Isthmus of Panama. All but his own ship were separated from him by the time he had passed the straits, but he went forward alone, plundered the Spanish settlements in Chile and Peru, and claimed California in the name of his queen. He tried to find a northeast passage to the Atlantic, but was driven back by the cold. Instead of returning to England by the way he had come, he determined to make a circuit of the globe, and having crossed the Pacific and Indian Oceans and sailed around the Cape of Good Hope, he reached England in November, 1580, nearly three years after he had set out. Soon after his arrival, the queen paid him a visit, and ate dinner on board his ship, after which she made him a knight. Five years later, as war had broken out between England and Spain, Drake captured several Spanish towns in the West Indies, and two years later he entered the port of Cadiz in Spain, and destroyed a great

SIR FRANCIS DRAKE

amount of shipping, which was being prepared for the Spanish Armada, a feat which he afterward called "singeing the king of Spain's beard." When the Spanish Armada attacked England in the following year, Sir Francis Drake was appointed vice-admiral under Lord Howard, and did gallant service. Some years later, in company with Sir John Hawkins, Drake led an expedition against the Spanish settlements in the West Indies; but, as the commanders did not agree, the expedition was not successful. His lack of success was the main cause of Drake's death, which took place in the West Indies in 1596. See *Life* by Barrow.

Drake, Joseph Rodman, American poet, born in New York City in 1795. James Fenimore Cooper and Fitz-Greene Halleck were his most intimate friends. Drake's longest poem is *The Culprit Fay*, his most popular short poem being *The American Flag*. Drake and Halleck formed a partnership, and together wrote many witty poems to the New York *Evening Post*, under the signatures, Crooker, Crooker, Jr. and Crooker & Co. Most of Drake's poems were written before he was 21. He died of consumption in 1820, at 25.

Drake University. Drake University is situated in Des Moines, Iowa. Founded in 1881, its attendance has increased steadily from 270 in 1882 to 1,843 in 1910. The university includes the colleges of liberal arts, law, medicine and the Bible. The graduates of Drake University have proved its worth. It is co-educational, and provides special facilities for courses peculiarly adapted to young women. Its endowment is about $342,000, and its income about $125,000. The value of the buildings is given as $307,000 and of the grounds, which include a fine stadium, $100,000. A Carnegie library, costing $50,000, has recently been completed. The president is Dr. Hill McClelland Bell.

Dram'a, a term applied to compositions designed to be acted on the stage. Dramas which are intended to cause laughter and good humor are called comedies, and those which rouse the deeper emotions, having a sad or terrible ending, are termed tragedies. There also are many dramas which strictly are neither one nor the other, but combine both elements. The drama probably had its origin in the union of dancing and singing, for most early nations have had rude methods of imitating actions on the stage. The people of India, China and Japan each had a drama of its own, but it is with the ancient Greeks that our real interest in the drama begins. It arose in Greece in connection with the worship of the gods, by hymns and dances and rites of various sorts. Soon, instead of a single person reciting a hymn or a comic song, a chorus, accompanied by instrumental music, with the aid of gestures and dancing, was used to reply to the single actor; and later the actor, instead of reciting to the chorus, who replied in song, addressed the leader of the chorus, who carried on a dialogue with him, the chorus coming in with songs at proper intervals. The most famous of Greek dramatic writers were the four dramatists, Æschylus, Sophocles and Euripides, whose tragedies are among the finest the world has seen, and Aristophanes, the great comedy-writer. Nor must Menander the comedian be forgotten. The Roman drama was derived from the Greek, but was not nearly equal to it. Plautus and Terence were the most celebrated of its writers. Of modern European nations, nearly all have long made use of the drama. During the middle ages the Greeks of Constantinople preserved the drama, and introduced it into Sicily and Venice before the church-drama of western Europe had begun. In the 12th century it became common to introduce short performances at banquets, and about the same time mystery-plays, as they were called, became common; they were scenes from the Bible, acted by priests on a stage built in a church or church-environment. Later, the so-called morality-play became common. It consisted of a fable which was directed against vice in general. The nation deemed for a long time to have the best dramatic writers was France. Her great writers, Corneille and Racine, followed the models of the Greek dramatists very closely, and their dramas are among the best in any language. In the writing of comedies the French probably stand at the head of the great writers of the world. Molière, their greatest comedy-writer, is unapproached in his best pieces by any writer except Shakespeare. In Germany the theater was simply an imitation of that at Paris until the time of Lessing. He was a writer of great originality, and taught his countrymen to develop their own literature. He was followed by a number of dramatists of the first rank, among whom Goethe and Schiller were far the greatest, Goethe being now considered by many critics to be, after Shakespeare, the greatest dramatist the world has seen. Italy and Spain have had many excellent dramatic writers, the most celebrated in Italy being Alfieri, Manzoni and Goldoni, and in Spain, Lope de Vega and Calderon. England has had fewer great dramatists than France, but her greatest, Shakespeare, is unapproached by any writer of any country, and Molière alone is equal to him in the writing of comedies. Other great dramatists of Shakespeare's time were Ben Jonson, Marlowe, Green, Beaumont and Fletcher and, in later times, Dryden, Wycherly, Congreve, Vanbrugh, Sheridan, Goldsmith and Lytton. See *English Literature* by Henry Morley; *Lectures on the Literature of the Elizabethan Age* by William Hazlitt; and the authorities on the modern drama.

Draper, Andrew Sloan, an American educator, was born at Westford, N. Y., June 21, 1848, and graduated at Albany Academy and Albany Law School. He set out in life as a practicing lawyer, and in 1881 was a member of the New York state assembly and a judge of the United States court of Alabama claims. He then devoted himself to educational work, and successively filled the offices of member of the Albany school-board, superintendent of public instruction at New York and superintendent of schools at Cleveland, O. In 1894 he became regent and president of the University of Illinois, resigning in 1904 to become commissioner of education of the state of New York. He has written largely on educational topics, American schools and American citizenship; on the powers and obligations of teachers; and on the responsibility and authority of school trustees. Among his published writings are *The Organization and Administration of City-School Systems* (1888), *American Schools and American Citizenship* (1891), *Public School Pioneering in New York and Massachusetts* (1892), and *American Universities and the National Life.*

Draper, John William, an American chemist and physiologist as well as author, was born in 1811 near Liverpool, England. He came to America in 1833, and studied medicine in the University of Pennsylvania. After graduating he was appointed professor of chemistry and physiology in Hampton-Sydney College, Virginia. Some years later he accepted a like position in the University of the City of New York, and in 1841 was appointed professor in its medical college. He discovered many important facts of spectrum-analysis, and made important discoveries in photography. Besides his scientific writings, he found time to write valuable literary works, his *Intellectual Development of Europe* being translated into most European languages; the *History of the American Civil War* has also been widely translated. He died in 1882.

Drawing. "Drawing is the act of moving anything in one's own direction." If the thing moved be a point capable of leaving a record of its course, the result is the drawing of a line. Drawing in art is the indicating of directions by the making of lines, these lines generally forming the contours of spots and representing the profiles of forms.

In its strictest sense drawing applies to lines only: thus, *outline drawing* means the expressing of form or contour by lines alone. More broadly, the term drawing designates any representation more or less in outline, even including the use of tones of gray or color, particularly when such tones are produced by lines or are dependent upon the limiting influence of them: as, *pen-and-ink drawing,* in which the depth of the tones varies with the number or area of the ink-lines upon the white paper; *charcoal-drawing,* in which the depth of the tones varies as the weight of the lines employed; *pastel-drawing,* in which the colors are ordinarily applied with crayon, stump or finger. In the latter two forms of expression the lines may or may not disappear with the completion of the work. *Water-color drawing* is a term falling into disuse with the changing methods of employing water-color pigments. Water-colors were formerly used largely for tinting pictures in pen or pencil outline, and are now used more independently. (See PAINTING.) *Wash-drawing* is a term employed by modern illustrators to designate work in monochrome water-color done without the use of opaque white.

Among artists the word drawing may refer (1) to the indicating of form or contour either in pictorial or plastic art with reference to truth, beauty, technical perfection or all of these; as, "the splendid drawing of Michelangelo's *David,*" meaning the beauty and perfection of the contours, or (2) to form or contour itself when viewed from the standpoint of the artist; as, "the drawing of the branches against the winter-sky" referring to the appearance of the actual branches against the sky. Great masters of this particular aspect of art-expression which we call *drawing* include Pheidias, Botticelli, Michelangelo, Andrea del Sarto, Raphael, Holbein, Ingres, Puvis de Chavannes, Hokusai, Menzel.

In educational phraseology the term drawing is often applied to all work in art, though it really designates only one factor in certain forms of art-expression. This somewhat inaccurate use of the term is due to the supposed commercial value which first won for this form of art-expression its place in school-courses, but in most localities the work has now outgrown both this estimate of its value and the methods of teaching that went with it. *Mechanical drawing,* the making of drawings with the aid of instruments and according to certain accepted conventions for the guidance of workmen and scientists, is properly an aspect of construction rather than of art. In many schools mechanical drawing is now taught in the construction department. *Working drawings* are mechanical drawings, made to scale and presenting a sufficient number of views of the given object to show all the facts of its form. *Freehand drawing* is a loose term covering generally all drawing that is not mechanical, even including in some localities water-color painting, design and certain forms of construction. This term shows the disciplinary rather than educational light in which art was at one time held as a school subject.

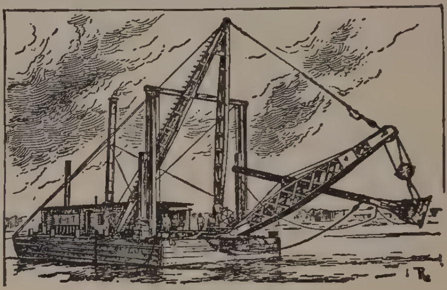
Courses in drawing. Since drawing concerns itself largely with contours and edges, mere drawing is rather an abstraction, and in the interests of the children would take its place after color, a child's interest in the *shape* of the color-spot coming with further development. Drawing for its own sake, or nicety of drawing, is a thing beyond his comprehension until he reaches the higher grades To lead into more refined drawing through his awakening interest in the shapes of the color-spots he has occasion to employ, both in his design and in his representative work, would seem to be a true way of recognizing both his capabilities and his interests

In the older art-schools it has been the practice to teach drawing by setting the student to work in charcoal or crayon from plaster casts of geometric or vegetable forms, or of fragments of the human figure, or even to have him begin by copying plates made from drawings of this kind, this work to lead ultimately to drawing from casts of the whole figure or of groups of figures, and thence to drawing and finally painting from the live model. The reverse order of work is now beginning to obtain, however, and in some modern art-schools students begin their study from the live figure in motion, and as knowledge of detail seems to become more necessary they turn to the cast, leaving the close study of the details of the figure to the last.

The educational content of drawing sums itself up about as follows: Drawing of itself may and probably will lead to an appreciation of beauty of line. It will also develop accuracy of vision. It demands a nice condition of muscular control, and it involves a complete acquaintance with the conventions of projection-perspective.

George William Eggers.

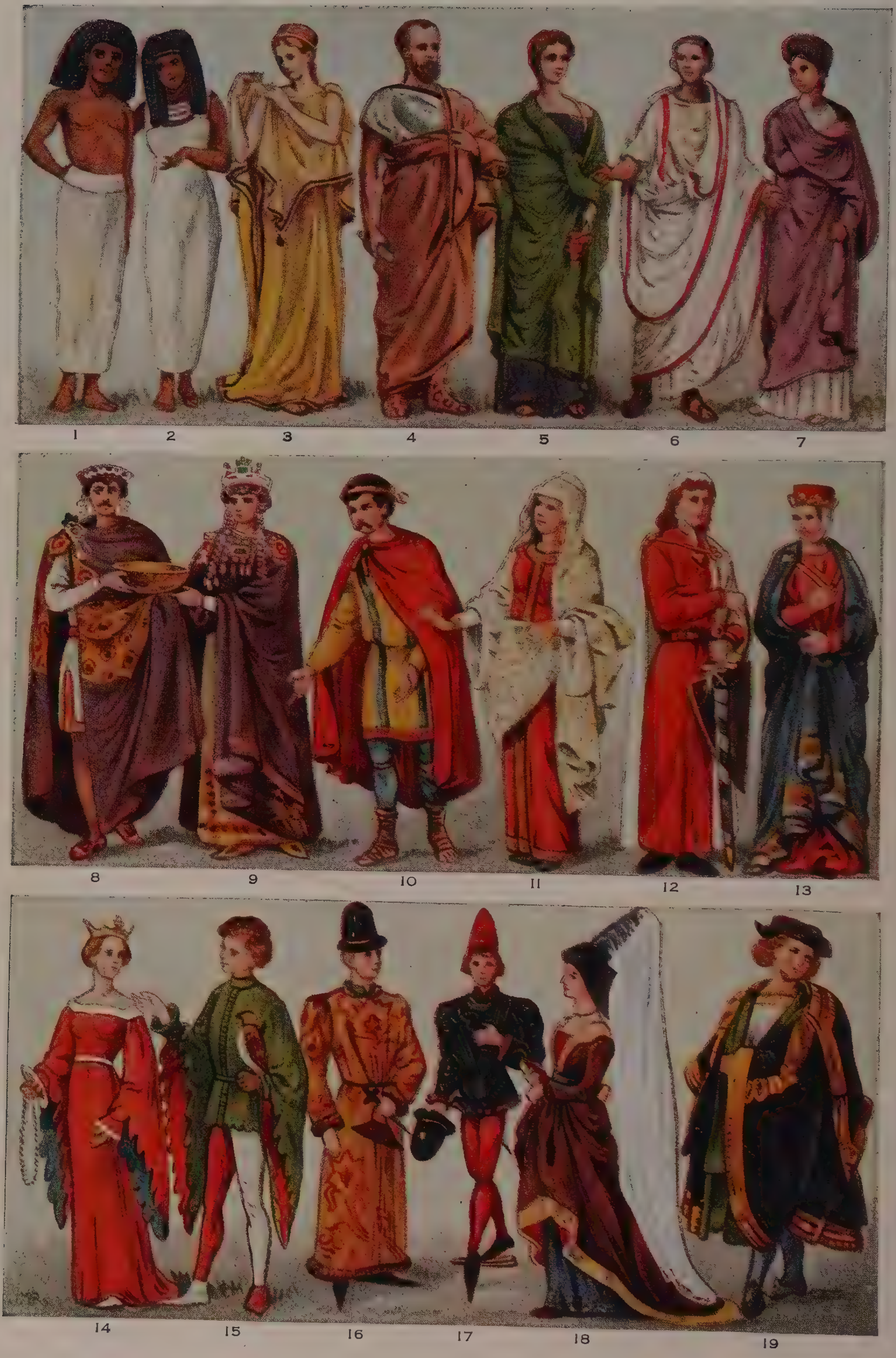
Dredging, the excavating or scooping out of soil, mud, sand or rock under water by a machine called a dredge. Dredging is used in deepening and widening the beds of rivers, canals, harbors. The forms of modern dredges are very numerous, different conditions requiring different forms. A common form is that in which a large number of buckets or scoops is attached to an endless chain or a wheel. As the chain revolves, the buckets are filled and raised in succession and emptied at the top into a barge for that purpose. Another common form is the single scoop or dipper dredge. of the Osgood or other type. On a long arm, which can be let down and moved along the bed of the stream, is a scoop of suitable form, which can be thus filled, and when filled can be raised and emptied. Other machines include the clam-shell and oyster-dredge, the grapple and the suction-dredge, besides those used in deep-sea dredging. These latter collect samples of sea-bottoms, for the inspection of marine plants and animals. Another purpose of deep-sea dredging is to ascertain the nature of the ocean-floor, so as to determine its suitability for the laying of cables. Soundings for this and other purposes have been made, often at great depths, as in the explorations of the *Albatross*, of the U. S. Fish-Commission, which has made tests of the sea-bottom and brought up deep-sea life at depths varying from 4,000 to 5,000 fathoms. Modern dredges are operated by powerful steam-engines, and are strong enough to remove materials of any sort, even 70-ton boulders. Some dredges have a capacity of over 1,000 cubic yards an hour. Dredging is also done by means of streams of water maintained in pipes by centrifugal pumps. The material to be removed is mixed with the water and carried along the pipes to the point where it is to be deposited in nearly level beds. This method is adopted for sand and soft mud, and has been extensively used in Holland and in San Francisco harbor, where the dredged material is used to fill low ground. Under special conditions pneumatic excavators have been used. In these the materials are drawn into pipes by the suction due to a vacuum. Such an excavator was used in the construction of the great Tay bridge, Scotland.



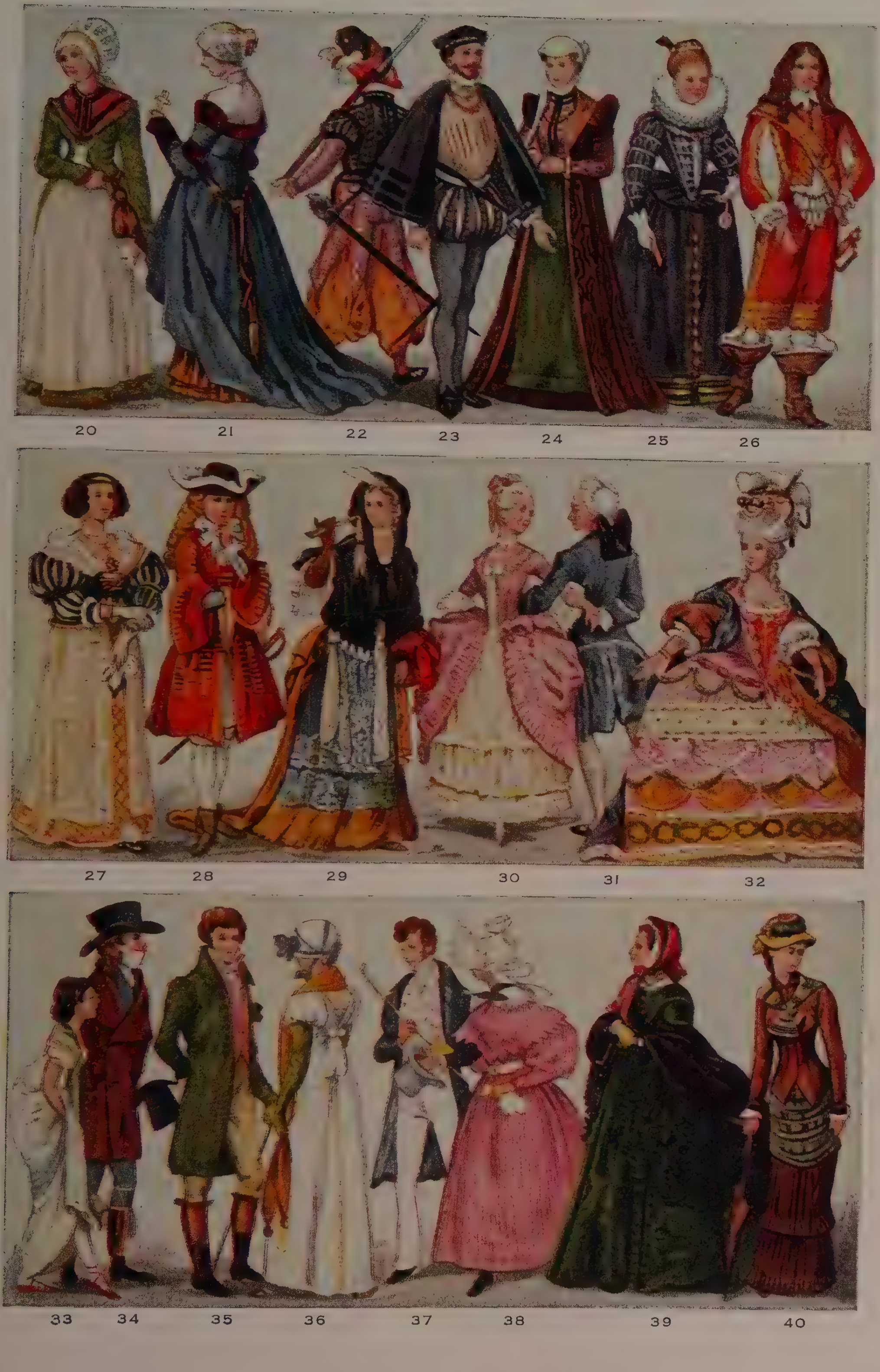
A SCOOP-DREDGE

Dreibund, The, or **Triple Alliance,** is a league between the European powers of Germany, Austria and Italy, formed for the purpose of mutual protection, in the case of attack upon any of them by other nations. The league was formed in 1882, and has since been renewed. Prior to 1882, however, a league, known as the Dual Alliance, had been in existence since 1879 between Germany and Austria; and in 1882 Italy was admitted to the compact, which is now known as the *Dreibund*—an important safeguard in the maintenance of the balance of power on the European continent.

Dresden (*drĕz′den*), one of the largest cities of the German empire and the capital of Saxony, is situated in the beautiful valley of the Elbe. The city lies on both sides of the river, the old portion on the left bank having narrow, gloomy streets; while the streets of the newer part are wide and regular. Dresden is often called the German Florence, because of its many objects of high historic value. Many of the churches are of historic interest, and the palaces are beautiful buildings, containing fine collections of celebrated works of art. The court-



DRESS OF ANCIENT PERIOD (SEE DESCRIPTION FOLLOWING)



DRESS OF MIDDLE AND LATER PERIOD UP TO 1880 (SEE DESCRIPTION FOLLOWING)

Dress. Description of the dress of various peoples and periods as shown in the two preceding color plates.

1. *Egyptian Man.* Time—last period, or nearing the end of the old Dynasty. Costume—long skirt-like garment made of linen or cotton. Large curled wig.

2. *Egyptian Woman.* Time—same as No. 1. Skirt-like garment with shoulder-straps. Broad, highly colored shoulder-straps made of painted linen or small colored stones and pearls. Large curled wig.

3. *Ancient Greek Woman of Peplos.* Costume—merely a square linen cloth, one end of which is lapped over and fastened with pins at shoulders—not covering the whole body.

4. *Greek Man shown in "Chiton."* A short, sewed undergarment of part linen material over which the "Himation"—the woolen garment was thrown.

5. *Greek Woman during Hellenistic Period.* Costume—a long linen, usually colored, sewed undergarment with girdle and shoulder-straps over which the "Himation" was draped in similar manner as worn by the men.

6. *Noble Roman in Tunic.* A short garment trimmed with two stripes of purple (clavus) and worn by senators and like officials and the (toga praetexta) a purple bordered robe draped as shown and worn by the highest officials.

7. *Roman Woman during the time of the Roman Empire.* Costume—similar to that worn by Greek women of late period. Long, usually white, sleeve garment (stola) over which when out of doors a colored robe was thrown. High, fancy coiffure.

8. *Byzantine Emperor.* Justinian. Costume—gold embroidered girdle, white undergarment with purple mantle trimmed with yellow squares (clavus)—to distinguish highest rank of nobility. Diadem of pearls. (Taken from Mosaic picture 2nd half of 6th Century in San Vitale in Ravenna.)

9. *Byzantine Empress.* Theodora, wife of Justinian. Costume—white robe with hem embroidered in gold and colored stones. Purple embroidered mantle. Diadem of pearls over which strands of pearls hang down to shoulders.

10. *Frankish Nobleman.* Costume—long-sleeved skirt-like coat—the Roman tunic with clavi. Tight leggings—ankles wound as was customary in Frankish period. (Taken from a miniature, ending of the 9th Century.)

11. *Frankish Lady.* Costume—richly embroidered robe with wide white sleeves. Scarf of costly material draped over the head and shoulders. Colored shoes. (Taken from a miniature ending of the 9th Century.)

12. *German Nobleman.* 13th Century. Long, girdled robe, mantle fastened with metal tassels. Head-dress of fine linen tied under chin. (Taken from statue in the Dom at Naumburg.)

13. *German Lady of Nobility.* 13th Century. Long, girdled dress—mantle fastened or trimmed with cord and tassels. Cap surrounded by diadem and fastened either on top or at temple with banding brought under chin and pinned to cap.

14. *Titled Young Lady.* (1400). Wide, decolleté, clinging dress with long wide sleeves having scalloped edge.

15. *Titled Young Man.* (1400). Costume—short, tight coat, with long wide sleeves having scalloped edge. Leggings and shoes of different color.

16. *Gentleman of Burgundy.* Costume—brocaded long coat, with padded sleeves (mahoitres). Pointed shoes (aumoniere.) Bag, dagger and belt. (Taken from a miniature in the last half of the 15th Century.)

17. *Gentleman of Burgundy.* Padded sleeves showing at neck the collar of the undergarment. Pointed shoes with extra outer soles. (Taken from a French miniature in the last half of the 15th Century.)

18. *Lady of Burgundy.* Blue underdress over which a trailing robe with border is draped. The robe being low cut at neck, allowing the red breast-band of (cotte) to show. Cornucopia-shaped hat with long veil draped from the back. (Taken from French miniature in last half of the 15th Century.)

19. *Nürnberg Citizen.* (1500). Costume—wide, gold-embroidery bordered velvet mantle.

20. *Nürnberg Woman.* (1500). In house-dress with cap apron and fichu over decolleté dress.

21. *Basel Woman.* (1525). In so-called Gretchen costume carrying on long hanging belt, her scissors, knife, etc.

22. *German Militiaman.* (1550). Costume—slit vest and long wide bloomers.

23. *German Gentleman.* (1575). In Spanish costume—padded short pants with slits showing bright colored padding. Padded vest and tights. Cape with small ruffed collar and small cap (toque) with cord and feather.

24. *Augsburger Patrician.* (1575). German costume under Spanish influence. Bell-shaped stiffened skirt. Small ruff around neck. Cape brocaded plush. Sleeves with small puff at top and apron.

25. *French Lady or Madame.* (1600). In Spanish costume—stiff hoop-skirt drawn tight at waist-line with stiffened frill at

waist. Padded sleeves. Large ruff collar. (Taken from French Miniature.)

26. *German Gentleman.* (1650). A sample of the costume worn by wealthy Germans at the end of the 30-years War. Short vest with wide linen collar. The open sleeves and short vest allow the white skirt to be visible. High boots, the wide tops of which are trimmed with lace. Long hair, or sometimes wig.

27. *German Lady.* (1650). Costume worn at the end of the 30-years War. Short-waisted effect with wide puffed sleeves. Wide costly lace collar. Shoes adorned with rosettes. (Taken from French Miniature.)

28. *Aristocratic Gentleman.* (1700). Costume—tight gold-trimmed over-coat, three-cornered hat with feather trimming. Lace ruff, muff, half-boots with red heels. Blonde wig.

29. *Aristocratic Lady.* (1700). Street-costume. Blue under-garment with silver embroidery and gold fringe. Trailing over-skirt, turned back lace cap. Muff with bow of colored ribbon. Cape with lace decorations.

30-31. *French Fashions of 1760.* Lady in short hoop-skirt with over-garment puffed at waist, on sides and at back. Hair powdered. Gentleman — with small powdered wig.

32. *Marie Antoinette.* Court costume. (1780). Very full hoop-skirt flat in front and back, padded at hips, richly embroidered. High, powdered coiffure, adorned with pearls, flowers and feathers.

33-34. *French Couple.* At time of Directorate. (1795). Lady in latest style showing departure of hoop-skirt and laced waist. Shoes without heels.

35-36. *Lady and Gentleman.* At time of the First Empire. (Taken from Fashion Journal in 1807).

37-38. *Lady and Gentleman.* At time of the "Biedermeier."

39. *Lady in Crinoline.* At time of the Second Empire. (1858). (Taken from Fashion Journal.)

40. *Fashion in 1880.* Tight skirt.

theater is another fine building. There also are many beautiful monuments scattered through the city. The chief pleasure ground is the *Grosser-Garten*, in which are a summer theater and two museum. Near by, is the zoological garden. Dresden is famous for its artistic, literary and scientific collections. The most valuable of these is the picture-gallery, in the museum, which contains 2,500 pictures. This collection is one of the finest in Europe. The so-called Japanese palace contains a library of 300,000 volumes and collections of coins, ancient works of art, china and similar objects. Among the chief branches of industry in the town are manufactures in gold, silver, straw-plait and scientific and musical instruments. Dresden is known to have existed in 1206. It was almost entirely burned in 1491, but was soon rebuilt. In the first half of the 18th century Augustus I and II, Electors of Saxony, by their extensive improvements began to give the city the appearance it now has. The city suffered severely in the Seven Years' War, in the wars of Napoleon and in the Revolution of 1848. It has greatly improved in the last 25 years. Population, 546,882.

Dreyse (*fôn drī′ze*), **Johann Nicholas von,** inventor of the needle-gun, was born in Prussia in 1787. He was a locksmith in his early years, but later worked in a gun-factory in Paris; after which he set up an ironware factory in his native town, where he spent most of his time in making improvements in firearms. In 1836 he completed the needle-gun, which was introduced into the Prussian army in 1840. The next year he opened a gun-factory, which soon supplied weapons for all the German states. He died in 1867.

Drift. Drift or glacial drift is the name given to the deposits made by the ice of the glacial period and by the waters which arose from the melting of the ice. The drift consists of bowlders, cobbles, pebbles, sand and clay, often mingled without trace of arrangement. The bowlders are often two or three feet in diameter, and occasionally 10 or 20 or even 30 feet or more. They are sometimes known as hard heads or, when black, as nigger-heads. They may be composed of any sort of rock over which the ice came. The stones of the drift are often striated. The clay of the drift is really rock-flour, being composed of the comminuted products of rock. The drift deposited by the ice directly is often called till or bowlder-clay. It is not stratified. The drift deposited by the water to which the melting of the ice gave rise is stratified. It consists of gravel, sand or clay.

Drift covers most of the United States north of a line drawn along the south coast of New England, through Long Island, northern New Jersey and Pennsylvania, southern Ohio, Indiana and Illinois and thence along the general course of the Missouri. Drift also covers most of British America, and there are local areas of drift in the western mountains south of the above line. There is a small area of 8,000 or 9,000 square miles, in southwestern Wisconsin and the adjacent corners of Illinois, Iowa and Minnesota, where drift is absent. This area is known as the driftless area.

The sources whence the materials of the drift came are often determinable. Thus, masses of native copper, which could only have come from the Lake Superior region, have been found in Illinois and Indiana. They show that the ice which made the drift of this region moved in a southerly direction. Bowlders from the Palisade ridge above New York are found on Staten Island and on the west end of Long Island, as well as in New York city, showing that the ice here moved to the southeast. The drift is in places as much as 500 feet thick, though its average thickness in the United States is probably not more than half the latter figure.

Drift also covers much of northern and northwestern Europe, reaching south to southern England, the mountains of Germany and to still lower latitudes in the western and central parts of Russia.

For full definition of the drift and its relations see *Journal of Geology*, Vol. II., pp. 708 and 837; and Vol. III., p. 70. For classification of the drift see the same journal, Vol. II., p. 517. See also Dana's *Manual of Geology; Third Annual Report of the United States Geological Survey;* and articles by Chamberlin, *State Geological Reports*, for the drift of the several states. R. D. SALISBURY.

Dromedary. See CAMEL.

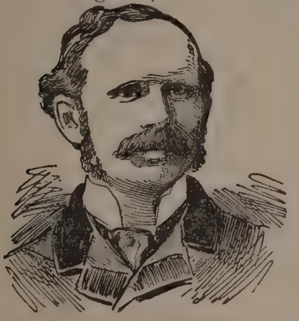
Drowning, accidental asphyxia, the remedy for which is the instant resort to artificial respiration and circulation, by supplying fresh air to the lungs and forcing the blood from the engorged right side of the heart. In cases of accidental drowning, where the victims have for some time been submerged, it is well to know what to do to recover them from the sea and how to proceed in the way of resuscitation. In reaching a drowning person, the first precaution on the part of the rescuer is to take care how to approach the victim in the water, after divesting oneself as speedily as possible of all impeding clothing. The general rules to be followed are as follows: In attempts to rescue, if the victim has sunk, the first thing to note is the spot where the body has gone down. If the water be smooth, this will generally be made plain by the air-bubbles which will occasionally rise to the surface, allowance being of course made for the motion of the water if in a tideway or stream, which will carry the bubbles out of the perpendicular course in rising to the surface. If the victim has not sunk but is still struggling on the surface, an assuring hail that help is near should be given; though in approach to him care should be taken that the one in peril does not seize or otherwise place at a disadvantage his would-be rescuer. It will often be better to hold off until the victim has lost consciousness or even sunk. When the rescuer has got close to the drowning one, or recovered him if he has sunk, take fast hold of the hair of his head, turn him as quickly as possible on his back, at the same time giving him a sharp pull which will cause him to float, then throw yourself on your back also, and either swim for the shore or towards some boat which may put off to the double rescue. Rescues are frequently made by floating idly, until other help comes, and often by paddling with the feet merely, so as to keep the head above water. On rescunig a person by diving to the bottom, the hair of the head should be seized by one hand only, and the other used in conjunction with the feet in raising yourself and the drowning person to the surface. If in the sea, with an outsetting tide, it will be found best to keep both yourself and the drowning one afloat merely, until other help arrives.

Treatment when the body is brought ashore. Summon a physician, then expose the patient to a current of fresh air, wipe dry the mouth and nostrils, rip the clothing so as to expose the chest and waist, and give two or three quick smarting slaps on the stomach and chest with the open hand. If the patient does not revive, try to drain the water from stomach and chest by turning the body face downwards; place a bundle of lightly rolled clothing beneath the stomach, and press heavily over it for half a minute or so long as fluids flow freely from the mouth. Before this, if the jaws are clinched, it will of course be necessary to separate them; to keep the mouth open, force a cork or small piece of wood between the teeth, clearing the mouth and throat of mucus now and then by wrapping a handkerchief round the finger and introducing it into the throat. Especially keep the pit of the stomach, as the patient lies on his face, above the level of any other portion of the body. If other aid be present, let it be utilized by giving an assistant a dry cloth or handkerchief to grip and hold the tip of the patient's tongue, so as to prevent its pulling back and obstructing the wind-pipe; and with the other hand let him grasp both wrists and keep the arms forcibly stretched back above the head, thereby increasing the prominence of the ribs, which tends to enlarge the heart. Meanwhile, actively dry and rub the body, taking care at the same time not to interfere with the means to which resort is had to produce breathing. The limbs should also be well-rubbed, and in an upward direction towards the body, with firm grasping pressure and energy, using preferably the bare hands or dry, warm flannels, which should also cover the body to restore its heat. Bottles of hot water, or heated bricks or stones, should moreover be applied to the limbs and soles of the feet. As soon as breathing is reëstablished, the patient should be stripped of all wet clothing and wrapped in blankets, or put to bed, comfortably warm, but with a free circulation of fresh air. A little brandy and hot water, or other stimulant, should be given the patient every 10 or 15 minutes for the first hour, and as often thereafter as may be deemed expedient; a mustard plaster over the breast is often prescribed, where there is danger of congestion of the lungs; but in most cases it is essential to refrain from effusive fussing and to let the patient rest, especially if watched over by a physician or by an experienced professional nurse.

Dru'ids were the priests of the early Gauls and Britons. How their religion arose or where they got it is unknown. Cæsar has described them more fully than any other writer. They seem to have believed in God and in a future life. Their temples were circles of uncovered stone, open to the heavens. Fire was worshiped, and human beings, especially prisoners and criminals, were often sacrificed. The oak and the mistletoe were held sacred; and whenever mistletoe was found twining round an oak, a festival was held around the tree and a sacrifice was made. The Druids were of three orders — bards, prophets and priests. They had many privileges and possessed much power over the people. They were the teachers of the youth, and seem to have had considerable knowledge on many subjects They settled all disputes between the tribes, and thus were judges also. Their power gradually ceased after the Romans conquered Gaul. For some time after being driven out of Gaul and Britain, their religion lingered in the little island of Anglesea, but was finally driven out by the Romans. Immense stone ruins, supposed to be those of their temples, are still found in Great Britain and in western France. There also were druidesses of different ranks, but little is known of the druids' doctrines. See *Celtic Heathendom* by Professor Rhys.

Drum, a musical instrument supposed to have been brought to Europe by the Moors or soon after the crusades, though the Greeks and Romans seem to have had a kind of kettle-drum. The instrument called a timbrel in the Bible was probably a kind of tambourine, beaten with the fingers. In India a species of drum, called the tomtom, was used in early times, and a like drum existed in Egypt as early as 1600 B. C. Among savages the drum is the chief musical instrument. In the modern orchestra three varieties of drums are used: the ordinary side-drum, the bass-drum and the kettle-drum. The side-drum is a cylinder of thin wood or brass, covered at both ends with parchment, which can be loosened or tightened by strings. It is worn at the side, whence its name; and is beaten on the upper end with sticks. The bass-drum is an instrument of the same kind, but much larger, and is beaten on both ends with sticks having leather-pads. These two drums are used specially in military bands, but also in orchestra. The kettle-drum is a hollow brass or copper basin, covered with parchment and fastened by an iron ring.

Drum'mond, Hon. Sir George, was born in 1829, in Edinburgh, Scotland, and educated at Edinburgh University. He came to Montreal in 1854 to assume the management of a sugar-refinery and in 1879 founded the Canada Sugar-Refining Company. He also founded the Home for Incurables. For many years officially connected with the Bank of Montreal, he now is its president. He was appointed a senator of Canada in 1880.


HENRY DRUMMOND

Drum'mond, Henry, a Scottish author and evangelist, was born at Stirling in 1851. He was educated at Edinburgh University and also at Tübingen, in Germany. In 1877 he became professor of natural science in the Free Church College of Glasgow. He visited America soon after, on a geological expedition to the Rocky Mountains and the Yellowstone Park. He also explored in Africa, in search of unknown animals and insects. In 1877-78 he contributed articles on religious subjects to a magazine. These essays created a wide interest, and with others were made the foundation of *Natural Law in the Spiritual World*, which had the world for its reader. He followed that work with *The Ascent of Man* and with *The Greatest Thing in the World.* He also actively engaged in the religious work that has been carried on in the colleges of England and Scotland, and to him is largely due the change in the whole atmosphere of college-life in all great universities. He died in England, March 11, 1897. See *Life* by Prof. George Adam Smith.

Drum'mond, William Henry, born in Leitrim, Ireland, in 1854. He is professor of medical jurisprudence in Bishops College, and has achieved reputation as a writer of dialect-verse. Some of his poems appear in all standard collections of humorous poetry. The *Wreck of the Julie Plante* and *Johnny Courteau* are well-known.

Drum'mond Light, a very intense white light, produced by allowing an oxyhydrogen flame to play upon a piece of lime. This light is used very largely in projection-lanterns, and for this purpose stands second only to the electric arc. It is now generally called the oxyhydrogen light, although in practice the flame is generally produced by the combustion of coal-gas (not hydrogen) in oxygen. This light was devised in 1825 by Captain Drummond, a Scotch engineer (born 1797, died 1840). The invention was suggested by a remark which he heard in a lecture at the Royal Institution, where the speaker commented upon the brilliancy of incandescent lime. The light was originally intended for illuminating distant stations in the work of the geodetic survey.

Drummondville. A village on the Canadian side of the frontier, overlooking Niagara Falls. Called after General Drummond who was in command of the western army in the War of 1812. Lundy's Lane, a famous thoroughfare is a feature of the village. Nearby was fought one of the most important battles of the war. Now a part of the Canadian city of Niagara Falls.

Drupe, a stone-fruit, as the peach. See FRUIT.

Drupelet, a diminutive drupe, such as are aggregated in a blackberry or raspberry.

Druses (*druz'es*), a people and sect of Syria, remarkable for the success with which they have defended their independence against Turkey. They are distinguished because of their peculiar religion. Their total number is between 50,000 and 100,000, and they are chiefly occupied in producing and manufacturing silk. Their religion is an offshoot from Mohammedanism, though in some points it is much nearer to Christianity. The Druses are noted for their hospitality to strangers, and are very industrious. A bloody war between the Druses and the Maronite sect of Christians took place during the 19th century. It was stopped by the interference of European nations in 1860. See *The Druses of Mount Lebanon* by the Earl of Carnarvon; also *The Land of Gilead* and *Haifa* by Laurence Oliphant.

Dry'ads (*drī'ads*), in Greek mythology, were nymphs or goddesses of trees and woods, each tree or wood being supposed to be the home of its particular dryad.

Dry'den, John, a celebrated English poet, was born in Northamptonshire in 1631. He was educated at Cambridge University. His first work to attract attention was *Heroic Stanzas on the Death of Cromwell.* Soon after he wrote *Astrea Redux*, a poem hailing the restoration of Charles II. He next turned to the writing of plays for the stage; but most of his plays are immoral, and all are the poorest of his works. In 1666 he wrote a poem called *Annus Mirabilis* or *The Wonderful Year.*

JOHN DRYDEN

His most famous poems are satires on other writers or discussions with them. His *Absalom and Achitophel*, published in 1681, has been called the most powerful political and personal satire in English verse. It really is a political pamphlet against prominent men of the time, and full of bitter and biting sarcasm. Another of his best known poems is *Religio Laici*, a theological discussion in rhyme; his *Hind and Panther* is a satirical allegory in defense of the Roman Catholic church, to which he became a convert under James II. *Mac Flecknoe* is another bitter satire, against Shadwell, a literary rival. He died at London, May 1, 1700. See *Dryden* in the English Men of Letters Series; *Lives of the English Poets* by Dr. Johnson; and *Among My Books* by James Russell Lowell.

Dry Tortugas, a group of ten islets forming part of Florida, at the end of the Florida keys. They are of coral formation and are low and barren, except where covered with low bushes. On one of them are Fort Jefferson and a lighthouse. During the Civil War the fort was used to imprison Confederate prisoners, and several men who were convicted of having been concerned in the conspiracy to assassinate Lincoln were confined there.

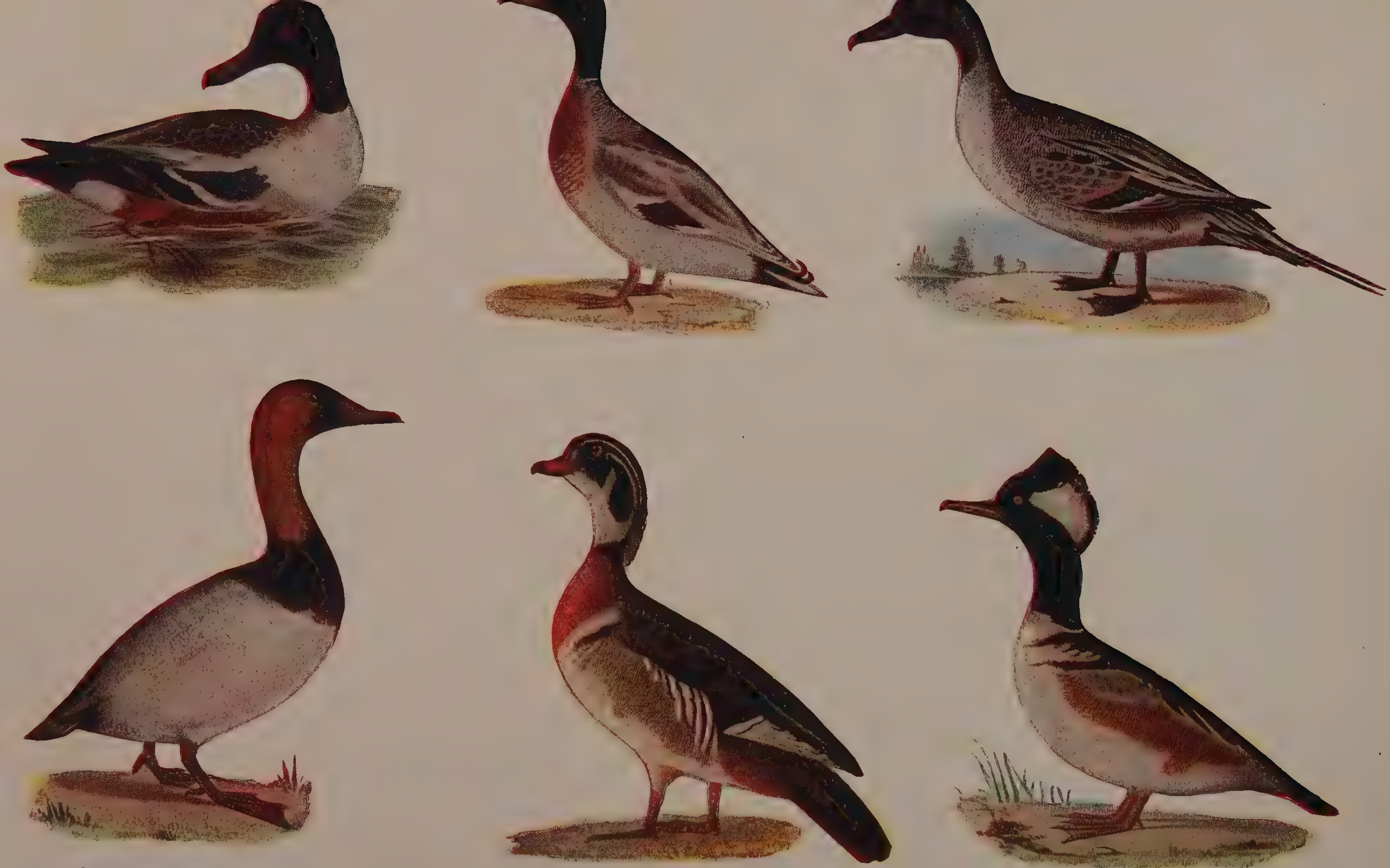
Dub′lin, the capital of Ireland, is situated on the River Liffey, at its entrance to Dublin Bay. The river cuts the city into two parts, which are joined by seven stone-bridges and two iron ones, and at its mouth are a good harbor and extensive docks and wharves. The trade is largely in timber, wine, cattle and agricultural produce. The Bank of Ireland, the custom-house, Trinity College, Dublin Castle, Christ Church, and St. Patrick's cathedral are among the finest buildings in the city. The cathedral of St. Patrick was founded in 1190 by John Comyn, archbishop of Dublin. One of the finest monuments in the city is that to Lord Nelson, which is 134 feet high. Those to O'Connell, Grattan and Burke are also noticeable. Trinity College is the most prominent university in Ireland. It was founded in 1591 by Queen Elizabeth, and to-day has a teaching staff of 54 professors, with an attendance of 1,100 students. It has special departments for the study of medicine, theology and engineering, besides the department of arts and sciences. Its library contains 190,000 volumes. The university sends two members to the house of commons. Phœnix Park, which contains about 2,000 acres, has beautiful scenery, and helps to make Dublin one of the most beautiful capitals of Europe. The Danes captured the city in the 9th century. Under Henry II the English took possession of the city. It was burned in 1190, and three later conflagrations have destroyed portions of the city. During the protectorate of Richard Cromwell the city was seized by the Royalist party, and in 1861 James II held a parliament there. In 1800 the act of union between Great Britain and Ireland was passed, and the flag of the United Kingdom was hoisted on Dublin Castle. Population, 309,272.

Dubois, William Edward Burghardt, an American educator of negro blood, was born in Massachusetts in 1868, and attended Fisk, Harvard and Berlin Universities. He is editor of the Atlanta University series of publications, and professor in Atlanta University. Professor Dubois is the author of several books upon the negro question, including *The Negro Artisan* (1903) and *The Relation of the Negro to the Whites in the South* (1901).

Dubois, (*du-bois′*), **Pa.,** a borough in Clearfield County, about 80 miles from Pittsburg. It is located in a coal-region, but besides its mining-interests it manufactures agricultural and mining implements, has flour and lumber-mills and an iron-works. Dubois has the service of three railroads. Population, 12,623.

Dubuque (*du-būk′*), a city of Iowa, county-seat of Dubuque County, on the west bank of the Mississippi. It is a center for many railroads, and has large manufactures of carriages, wagons, plows, machinery, flour, soap, etc., with extensive lumber and pork-packing interests. It also is the chief depot for the lead-regions of the northwest. There are many fine buildings in the city, and among its educational institutions, which are very good, are a Presbyterian theological seminary, an Episcopal seminary, four Roman Catholic seminaries and the Iowa Institute of Arts and Sciences. A large iron-bridge spans the Mississippi at this point. The city is the oldest permanent settlement in Iowa. In 1893 it was created the see for an archdiocese of the Roman Catholic church. Population, 38,494.

Duccio di Buoninsegna (*dŏŏt′chō̇ dē̇ bŏŏ-ō̇′nĕn-săn′yȧ*), also known as Duccio di Siena, was born about 1260 and died about 1320. He was the Italian painter who founded the Sienese school. His great picture is the altar-piece of the Madonna in the cathedral at Siena. When completed, the delighted people carried it in a procession to the church.



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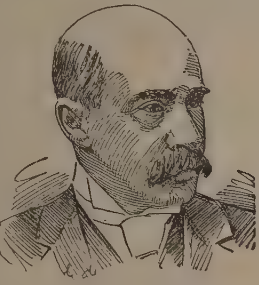
GROUP OF DUCKS

Spoonbill.
Canvas-back.

Mallard.
Wood Duck.

Pintail.
Hooded Sheldrake.



PAUL B. DU CHAILLU

Du Chaillu (*dü shȧ'yü'*), **Paul Belloni,** a distinguished traveler, was born at Paris, in 1835. He was educated at a Jesuit institution on Gabun River, in West Africa, where he was for many years a trader. He came to the United States in 1852 and was naturalized, writing about the same time a number of letters on the Gabun country to the New York *Tribune.* He set out on an exploring expedition to West Africa, in 1855, spending four years, and traveling 8,000 miles on foot, with no companions. On his return he published an account of his expedition, called *Explorations and Adventures in Equatorial Africa,* in which he gave much valuable information about the country and its people. Several years later he made a second expedition to the same region. He wrote several books for young folks, among which are *Gorilla Country, Wild Life under the Equator, Lost in the Jungle, The Country of the Dwarfs, Land of the Midnight Sun* and *Age of the Vikings.* He died on May 1, 1903.

Duck, a large swimming bird, with short legs and webbed feet. The duck-family embraces swans, geese and ducks. The ducks proper are divided into fresh-water ducks, sea-ducks and fishing-ducks. The river-ducks or fresh-water ducks feed in shallow water by tipping. They embrace the mallard, blue-winged and green-winged teals, pintail, wood-duck and others. The common domestic duck is descended from the mallard. The bay or sea-ducks are divers, and descend deep into the water for their food. They are the canvasback, red-head, broad-bill, eider-duck and others. Both these kinds of ducks have bills with roughened margins, that form a sort of strainer. In gathering their food, which consists of small mollusks, crustacea and seeds, they also take in considerable mud. They close the bill and force out the mud through the little spaces along the margins, retaining the food. The merganser or fishing-duck feeds on fish, and stands by itself. Most of the ducks nest in the north, and are hunted during the short period they rest and feed in our waters on their way north and on their return south. The black and the wood-ducks nest in the United States. As game-bird the mallard is unsurpassed, not outrivalled by the famous canvasback. They are almost vegetarians, eat sparingly of fish and other animal food. The haunt of the mallard—also called wild duck, also greenhead—is small lake or sluggish stream where wild rice and rushes grow. Here in August and September they harvest their favorite grain, and here the sportsman tries to harvest them. Ducks fly with great rapidity, are shy and like to fly. The duck lays her eggs, pale-blue or greenish-gray, six or a dozen in number, in a ground nest made of wild hay, leaves, etc. and lined with down from her breast. She very seldom leaves her nest during the 28 days of incubation; when she does, draws the down over the eggs to keep them warm. Many of the young fall prey to the duck-hawk, to water rats and large pike.

MALLARD-DUCK

Duckbill or **Duck-Male,** a peculiar mammal living in the waters of Australia. These mammals are about 18 inches long, covered with fine fur, and have webbed feet. They have a very broad, horny bill something like the bill of a duck. They burrow from under the water into the bank, and, coming above the water-level, form chambers in which they live. These are often found among the roots of a large tree. They are egg-laying mammals. The eggs are laid in an internal pouch of the mother and hatched there.

Ducking-Stool, an instrument once used for punishing scolding wives. It was made in various ways, often consisting of a chair fastened to the end of a beam, which could be lowered and raised. The woman was fastened securely in the chair, and the beam was then lowered into the water on the see-saw principle. The practice of ducking began in the latter part of the 15th century, and was common in England and America until the early part of the 18th century.

Dudevant. See SAND, GEORGE.

Dudley, Robert. See LEICESTER.

Dueling, from a Latin word meaning two men's battle, is a custom which has been common in many countries. The old ordeal by battle was a duel or judicial combat in which, instead of having a case argued in court as now, the two men fought before the judge, the one who was victorious being thought to have proved that he was in the right. Probably from this custom the modern duel arose. France is the country in which duels have always been most common. It was thought to be the part of a gentleman to resent any insult to his honor, and the most foolish and trivial things were considered insults. Duels were not common till the 16th century, and it is probable that the custom arose from the habit of wearing swords as a part of the ordinary dress, a custom introduced in the 15th century. In England many of the foremost statesmen in the early part of the 19th century fought duels, among them being such men as William Pitt and the Duke of Wellington. The most famous American duel was that between Hamilton and Burr, in which Hamilton was killed. This duel greatly roused the people of the country against the system, and duels became much less common. In Germany the university-students still keep up the practice, and think that a sword-scar across the face is a mark of honor. Dueling is also common in the German army, and is not forbidden by law. It was abolished in the English army in 1844. See *History of Dueling* by Dr. Milligen and *Dueling Days in the Army* by William Douglas.

Dufay (*dü-fā'*), **Charles François,** born Sept. 14, 1698; died July 16, 1739. He is distinguished especially as being the man who first discovered that there are two kinds of electricity, which we now call positive and negative. His electrical experiments are described in six memoirs published by the French Academy during 1733-4.

Duff, Alexander, a great Scottish missionary to India, was born April 26, 1806, in Perthshire. He was the first missionary sent from the Church of Scotland to India. On the passage he was twice shipwrecked, but reached India in May, 1830. He devised a new plan of missionary work among the natives, giving them instruction in all branches of knowledge as well as religious teaching. The college which he founded was very successful, and after a few years had from 600 to 700 pupils. Ill-health forced him to return to Scotland for a time, but he returned to India later and continued his work. In 1843, owing to changes in the Church of Scotland, Dr. Duff abandoned his college. In 1844 he helped to start the Calcutta *Review*, but had to go home in 1849. Some years later he made a missionary tour through America, which was very successful. Some time after he went to India again, where he was one of the founders and for some time the real head of the University of Calcutta. He died at Edinburgh in 1878, leaving his money to found a missionary lectureship. His knowledge of the affairs of India was so great that his opinion was often asked by the English government. Probably no one has done more to arouse missionary enthusiasm than he, and his introducing European education and methods of study among the natives was the beginning of a real advance in the social life of that country. See *Life* by Professor Thomas Smith.

Dufferin, Frederick Temple, Hamilton Blackwood, Marquis of, was born in Florence, Italy, in 1826. His mother was the grand-daughter of Sheridan and noted for her beauty as well as for her gifts as a song-writer. He was educated at Oxford University. Between 1860 and 1872 he held several prominent positions in the English ministry, and in 1877 was appointed governor-general of Canada. In this position he was very successful, the great development of Manitoba during his administration being especially noticeable. In 1879 he was made ambassador to Russia, and later held a similar position at Constantinople. After the rebellion of Arabi Pasha, in Egypt, Lord Dufferin was sent to restore order, and was successful in effecting several reforms in the management of Egypt. In 1884 he became viceroy of India, where his term of office was memorable for the successful arrangements with Russia regarding the frontier of Afghanistan and for the annexation of upper Burma. In 1888 he resigned, and was appointed minister to Rome and created a marquis. His last appointment was as British ambassador to France, retiring finally in 1896. His unfortunate connection as chairman of a corporation for company-promoting in London clouded his later years and did much to hasten his death. He is the author of *Letters from High Latitudes*, descriptive of a yacht voyage to Iceland; *Irish Emigration* and the *Tenure of Land in Ireland; Speeches and Addresses; Speeches in India* (1890). See his *Life* by Sir Alfred Lyall (London, 1905). The Marquis's wife, Lady Dufferin, wrote two delightful books, entitled; *Our Vice-Regal Life in India* (1890) and *My Canadian Journal* (1891), besides the narrative of her philanthropic work in India: *The Record of Three Years' Work* (1889).

MARQUIS OF DUFFERIN

Duffy, Hon. Sir Charles Gavan, statesman and man of letters, was born in Monaghan, Ireland, April 12, 1816, and educated at Belfast Institution. In 1842 he founded *The Nation*, a newspaper, in Dublin, was tried for seditious conspiracy in company with Charles O'Connell and others the following year, but was released on a writ of error to the house of lords. In 1846 he founded the Irish Confederation, and was repeatedly arrested and tried, though without conviction, for treason-felony. In 1852 he was elected against the chief secretary to parliament. Duffy resigned and went to Australia in 1856. He was minister of public works in the first responsible government of Victoria the year following, prime minister in 1871–2, and was unanimously elected speaker in 1877. He returned to Europe in 1880, and lived in Nice until his death on Feb. 9, 1903. In youth he was a noteworthy poet, and his love for literature showed itself to the end. *The Ballad Poetry of Ireland*, published in 1845, has gone through more than fifty editions. *Young Ireland: A Fragment of Irish History*, brought out in 1880, and *My Life in Two Hemispheres*, brought out in 1898, had much vogue. In addition may be mentioned *Conversations with Carlyle*, *The League of North and South*, *Life of Thomas Davis* and *A Bird's-Eye View of Irish History*.

His eldest son, John Gavan Duffy, born in Dublin on Oct. 15, 1844, and educated at Stonyhurst and Melbourne university, has held many important positions in the government of Victoria, having been minister of lands and agriculture in 1880, postmaster-general in 1890–2 and 1894–9, attorney-general in 1892, etc.

Duhamel (*dü'ä'mĕl'*). The most Reverend Joseph Thomas, Archbishop of Ottawa, was born in the province of Quebec in 1841, educated at St. Joseph's College, Ottawa, and ordained in 1863. Consecrated bishop of Ottawa in 1874, in 1876 he was made archbishop, in 1887 becoming metropolitan of the ecclesiastical province of Ottawa. He is chancellor of the University of Ottawa, and has been earnest and persistent in the cause of education.

Dukhobors. The name signifies Spirit-fighters, and was given to certain Russian peasants because they denied the divinity of the Holy Spirit. Indeed, they also denied that Christ is more than a superior man, who is reincarnated often, appearing in the persons of the founders of this sect and also in many other people at different times. The sect was established as early as 1750, in the province of Kharkov, in south-central Russia. Dukhobors have no church-building, and will not enter churches, saying that wherever two or three are gathered together a religious congregation exists. They have no ceremonies, even at marriages. The Ten Commandments they accept, and whatever else in the Bible seems to them to be useful. They are governed by an assembly of elders, and usually are quiet people, sober and hardworking. They are peasants, all of them. From 1750 to 1793 the sect grew so rapidly that the Russian government began a persecution. In 1800 this policy was changed to one of kindness. Large tracts of fertile lands in central Russia were granted the industrious peasants. In 1819 persecution was renewed, and they were removed to a less favorable district. In 1890 Pobiedonostseff began to apply to them his policy of forcing all Russians into the Greek church. The Dukhobors then begged permission to emigrate. Some were allowed to go to Cyprus; and a large body emigrated to Manitoba, where they still live. Their prosperity in that country continued until 1902, when large numbers of them started in the dead of winter in an aimless march, hoping somehow to find Christ. The Canadian government was finally obliged to drive them home to preserve their lives. In 1903 and again in 1908 the same thing occurred, women and children joining in the march.

Dul'cimer', a musical instrument which looks like a flat box, with wires run across, and tuned by pegs at the sides. It is played by striking the wires with a small piece of wood in each hand or, more usually, with two cork-head hammers. It is one of the most ancient of instruments, and may be regarded as the ancestor of the piano.

Duluth (*du-lōōth'*), a city of Minnesota, the chief lake-port of the state, is situated at the western end of Lake Superior. It has a fine harbor, is the terminus of ten railway-systems, and has an immense shipping trade in grain, flour, lumber, iron and iron-ore. Its grain-elevators have a capacity of 35,000,000 bushels. Its shipments include 10,000 barrels of flour per day, over 30,000,000 tons of iron-ore per year and many hundreds of millions of feet of lumber annually. It is a manufacturing and great wholesale center. Duluth has 38 splendid public-school buildings, with an average attendance of 15,000 pupils. Nearly 1,000 additional pupils are enrolled each year, an indication of the city's rapid growth. Population in 1910 was 78,466.

Duma, The, is the elective state-council of Russia and (with the Council of the Empire) the legislature of the empire. It originated in consequence of the revolutionary activity of the Russian people during and after the Russo-Japanese War (1904-5). On August 6, 1905, it was created by Emperor Nicholas II, and on October 17 a law was promulgated establishing as an unalterable rule that no law shall take effect without the *Duma's* approval and that to those whom the people elect shall be guaranteed real participation in controlling the legality of the acts of such authorities as the emperor appoints It consists of members elected for five years and representing the 97 provinces and the 28 largest cities. The election of the deputies is indirect, being made by electoral bodies themselves chosen by elective assemblies. On March 6, 1906, changes were made in the constitution of the *Duma.* It now has equal legislative powers with the Council of the Empire and the same right of initiative in legislation and of putting questions to ministers. Every measure must, before being submitted to the emperor for his sanction, be passed by the *Duma* as well as the Council. Any measure rejected by the *Duma* or by the Council is not even laid before the tsar. The *Duma*, like the Council, has the right to annul the election of any member. The sittings of both bodies are public. Debates may be ended by the decision of the majority. The *Duma* is not empowered to receive petitions or deputations. Ministers of the government may be elected to the *Duma* and vote as members. The legislators are paid about $5 a day during sessions, receive their traveling expenses, have personal immunity during sessions, and are liable to arrest only with the *Duma's* permission. Bills rejected by the tsar can not again be brought forward during the same session, nor those rejected by it be brought forward again at all without the tsar's consent.

Dumas (*dü'mȧ'*), **Alexandre,** a celebrated French writer, was born in 1802. He was brought up in a country-town, and when about 21 went to Paris to seek his fortune. He began to write plays, and soon his *Henry III* gained him a great reputation in Paris. Soon after, he visited Switzerland and wrote for a magazine his impressions of the journey. This work was also successful; but it was his *Monte Cristo* which made his reputation world-wide. This was soon followed by his no less famous *Three Musketeers.* After these works he undertook to write a large number of stories, any one of which was enough to keep an ordinary man busy. In order to do this work, he hired several young writers, and when they had written the first draft of a story, Dumas worked it over and had it published under his own name. This brought him into disrepute, but he kept on in the same plan. He was extravagant in every way, and after engaging in several wild schemes, one of which was joining Garibaldi in 1860, he lost all his fortune and died penniless in 1870.

ALEXANDRE DUMAS

Dumas, Alexandre (known as Dumas the younger), French novelist and dramatist, was born at Paris, July 28, 1824, and died there on Nov. 27, 1895. He was the son of A. Dumas *père*, author of *Monte Cristo*, and was educated at the *Collège Bourbon*, in Paris. He began his literary career by publishing, at the age of 17, a volume of poems, *Péchés de Jeunesse*, after which he accompanied his father on a tour in Spain and in northern Africa. He created a sensation by the issue of *La Dame aux Camélias*, after which, for nearly 40 years, appeared a stream of novels and writings for the stage, which deal largely with the *demimonde* of Paris. His brighter plays include *Le Fils Naturel, L'Ami des Femmes, Dénise* and *L'Affaire Clémenceau.* He became a member of the French Academy in 1875 and a grand officer of the Legion of Honor in 1894.

ALEXANDRE DUMAS (*fils*)

Du Maurier (*dü mō'ryȧ'*), **George L. P. B.,** a naturalized British artist, notable for his sketches in London *Punch*, was born at Paris, March 6, 1834, and died at London, Oct. 8, 1896. Settling early in London, after studying art in Paris, he began to contribute sketches to *Once a Week*, to *Cornhill Magazine* and to *Punch*, subsequently joining the staff of the latter, the pages of which he enriched with caricature sketches of society-life as typified in London high life. He also illustrated Thackeray's *Esmond* and *Ballads*, and in 1891 appeared as a novelist and lecturer. His novels, which were illustrated by his brush, include *Peter Ibbetson, Trilby* and *The Martian.*

GEORGE DU MAURIER

Dumouriez (*dümōō-ryȧ'*), **Charles François,** a general during the French Revolution, was born in 1739. When the revolution broke out, he joined the popular party, and in 1790 was appointed commander at Nantes. He was then named minister of foreign affairs, but resigned the position to take command of one of the French armies; and it was largely by his strategy that France was victorious over the allies at that time. He gained the battle at Volney, and overthrew the Austrians at the great victory of Jemappes, but was defeated by the Austrians in 1793. The revolutionists at Paris did not trust his loyalty to their cause, but denounced him as a traitor and summoned him to Paris. In order to save his life, he gave himself up to the Austrian general. He finally settled in England as an exile, and died in 1823. See *Life and Memoirs.*

Düna. See DWINA.

Dunbar, Paul Laurence (1872-1906), an American poet of African blood, was born at Dayton, O., in the high-school of which city he was educated. His volumes of verse, which are partly in dialect, received high commendation from critics and litterateurs. They include *Oak and Ivy* (1893), *Lyrics of Lowly Life* (1896), *Poems of Cabin and Field* (1899) and *Lyrics of the Hearthside* (1899). Besides these, Mr. Dunbar issued a volume of short stories, *Folks from Dixie*, and two novels, *The Uncalled* (1898) and *The Sport of the Gods* (1902). The poet-novelist also lectured, and in 1897 was appointed to a position in the Library of Congress; but subsequently he fell into ill-health and died at Dayton, Ohio, of consumption.

Dundee, the third city in size in Scotland, is situated on the River Tay, ten miles from its entrance to the sea. Among its fine buildings are the town-hall, with a spire 140 feet high, built in 1734; the Albert institute and Free library, the Royal exchange and several churches. Dundee is the chief seat in Great Britain of the manufacture of coarse linen fabrics. Manufactures of coarse cloth from jute, such as bagging and carpets, are also carried on, on a large scale. Dundee is also famous for its confectionery, which is sent all over the world. The city has a fine harbor and excellent docks. Dundee returns two members to Parliament. It has an interesting history that inspired *Up with the Bonnets of Bonnie Dundee!* Population 169,409.

Dunedin, seaport and capital of Otago, situated on Otago harbor, in South Island, New Zealand. It was founded in 1848 by settlers chiefly from Scotland, and received an impetus in 1861 by the discovery of gold in its neighborhood. The city has many handsome buildings and is lighted by electricity, and it has tramways and other civic improvements. Wool is a large export. Dunedin is the seat of Otago University, one of the four affiliated colleges of New Zealand. Population, with suburbs, 64,237.

Dunes. Where the land is gaining on the sea, either at the bars or mouths of rivers or along the seashore, the land deposited is of fine sand. This the wind, in time, often heaps into ridges, sometimes of considerable height, but more often 10 to 30 feet. Such ridges, which usually are bleak and waste, are dunes. They are found along the western shore of France, along the eastern coast of the United States and in many other places. They may be dangerous to man, first because he is sometimes tempted to build on them, though a great storm may sweep them away; and second because the sand-hills are sometimes carried inland by the wind. In France villages have slowly been covered and destroyed by advancing dunes.

Dunkards (from the word meaning "to dip"), Dunkers, or German Baptist Brethren, are a large sect of Baptists which was first organized in 1708 in Westphalia. Alexander Mack was chosen as its first minister. The sect is a strict one, and in some respects like that of the Quakers. The Dunkards live and dress plainly, and hold it wrong to fight or take an oath. The sect emigrated to America early in the 18th century, and by 1730 was established in Pennsylvania. An offshoot of the Brethren, known as the Seventh-Day Dunkards, keeps the seventh instead of the first day as the Sabbath. But the greater part of the sect, though they were driven from Germany by persecution, do not hold different beliefs from other Protestant churches. They, indeed, have a monastery, but those who enter it are not forbidden to marry. Their religious paper, *The Gospel Messenger*, has a wide circulation. Even in the 18th century the Dunkards expressed themselves against slavery and, above all, against the slave-trade. Since 1883 there has been a division among the Brethren; those of the Old Order clinging to older forms of dress and opposing higher education, while the Progressives see the need of outward changes and are content to preserve the spirit of their faith.

Dun'kirk or **Dunkerque,** the northernmost seaport of France, is on the Strait of Dover. It is a very strong place, both from its fortifications and from the ease with which the whole surrounding country can be submerged by water. The harbor is large, and the city carries on shipbuilding extensively It has manufactures of linen, leather, cotton, soap, etc., and has a large trade by sea The town was burned by the English in 1388, and was captured by them under Cromwell in 1658, but was sold to Louis XIV by Charles II a few years later. By the treaty of Utrecht the French were compelled to destroy the fortifications, but they were rebuilt in 1783. The Duke of York sought to capture it in 1793, but was defeated with great loss. Population, 38,891.

Dunkirk, N. Y., a city and port of entry on Lake Erie, 38 miles southwest of Buffalo. It is one of the chief towns in Chautauqua County, and is the western terminus of the Erie Railroad, which connects it directly with New York, 460 miles distant. It has a number of mills, factories and elevators, and extensive locomotive-works. It is well-situated for trade, with its excellent harbor and good railway facilities. Population, 17,221.

Dunmore, Pa., a town in Lackawanna County, northeastern Pennsylvania, in the rich anthracite-coal region of the Lackawanna valley. It is situated two miles north of Scranton, the Erie and Wyoming Valley Railroad traversing it. Its trade is chiefly in coal. Population, 17,615.

Dunne, Finley Peter (1867–), American journalist and humorist, popularly known as Mr. Dooley, was born in Chicago, Ill. After obtaining a common-school education he began his career as a reporter, subsequently rising to the post of city-editor, a member of the editorial staffs of the *Times*, *Times-Herald* and *Evening Post*, and finally editor-in-chief of the *Evening Journal*. His Mr. Dooley sketches, which have made the writer widely known, first appeared in the Chicago *Times-Herald*, the prototype of the humorous commentator on political and social themes being a Chicago saloon-keeper who died in 1901. The Spanish-American War gave Mr. Dunne a notable theme for the exercise of his peculiar philosophy mixed with satire; while he widened his audiences by his publications, which include *Mr. Dooley in Peace and in War; Mr. Dooley in the Hearts of his Countrymen* (1898), *Mr. Dooley's Philosophy* (1900), his *Opinions* (1901); his *Observations* (1902); and *Dissertations*, all embodying shrewd criticisms and alternately wise and amusing talks. Mr. Dunne now resides in New York City.

Dun'stan, St., archbishop of Canterbury, was born in Glastonbury in 924 A. D. He was educated at the abbey of Glastonbury and became a monk there, giving himself up to study and music. Dunstan soon after went to the king's court and was appointed abbot of Glastonbury. His abbey soon grew to be a famous school, but Dunstan did not give all his time to it; he became the chief adviser of King Edmund. When the young Edwy became king, Dunstan lost favor, but was soon called back by Edgar, who had become king of the country north of the Thames. After Edwy's death Edgar became king of the whole country and Dunstan was made archbishop of Canterbury. The wise measures which made Edgar's reign one of the most peaceful and prosperous in early English history were largely due to Dunstan. It was his policy to join the Danes and English in England into a single kingdom. He died at Canterbury in 988. See *Memorials of St. Dunstan*, by Bishop Stubbs.

Dupleix (*dũ'plã'*), **Joseph François, Marquis,** a celebrated governor of the French East Indies, was born in 1697. His father was a shareholder in the French East India company, and had his son appointed to a position in India, and ten years later he became superintendent of Chandernagore in Bengal. He was so successful that he was soon appointed governor-general of Pondicherry, including all the French Indies, and there he was so skillful in managing the native chiefs that the Carnatic soon became almost a French province. When war broke out between England and France, Dupleix was for a time successful against the English; but his plans were finally frustrated by Lord Clive. In 1754 England and France came to an agreement regarding India, and Dupleix was recalled to France, where he died in 1764. Had the plans of Dupleix succeeded, it is probable that India would now be under French instead of English control. See *French in India*, by Malleson, and *Struggle between England and France for Supremacy in India*, by Rapson.

Dupont (*dû-pŏnt'*), **Samuel Francis,** an American rear-admiral, was born at Bergen Point, N. J., in 1803. In the summer of 1861 he was given command of the Atlantic blockading squadron. He also commanded the expedition which captured Port Royal harbor, in the same year. He was made rear-admiral in 1862, and the next year commanded the fleet of ironclads which attacked Sumter, where he was defeated. In 1863 he resigned his command, and died at Philadelphia in 1865.

Duquesne (*du'kân'*), **Pa.,** a borough in Allegheny County, about ten miles from Pittsburg. It is located on the Monongahela River, and is served by the Pennsylvania Railroad. It is engaged in manufacturing steel and iron-products. Population, 15,727.

Durand (*dû-rănd'*), **Asher Brown,** a well known American artist, was born at Jefferson, N. J., in 1796. He engraved many excellent portraits, but gained his greatest fame as a landscape painter. The *Capture of Major André* and *A Primeval Forest* are among his best paintings. He died at South Orange, N. J., Sept. 17, 1886.

Duration in Plants. The variation in duration among plants is extreme. Some of the simplest of plants may endure but a few days or even less, while certain trees are known to endure for several centuries. Among seed-plants an attempt has been made to classify duration roughly under three heads, namely, annual, biennial and perennial plants. The annual plant lasts but a single growing season, but even within that limit there are great differences in actual duration. Often, also, confusion arises from the fact that the parts above ground may be annual while those beneath the surface may endure for a much longer time. There are annual stems which are put up year after year by perennial roots or underground stems. A true annual is a plant which disappears completely at the end of the season, and continues over to the next only in the form of a seed. The name biennial has been given to those plants which form foliage one season, put up a flower-stalk the next, and then disappear. The radish, turnip and the like are good illustrations; but under cultivation they have been made to go through their whole life-history in one season. Perennial plants are those which endure season after season, and of course differ widely from one another in the number of years involved in their duration. In general, annual and biennial plants belong to the same category, for they are comparatively transient forms. The perennial plant is the one which really endures, whether in the form of underground parts or in aerial parts which endure, as in shrubs and trees. The ephemeral habit, which consists of the disappearance of plants in one or two years, to be carried over to a subsequent growing-season by seeds, is a habit which has resulted in protection against an unfavorable season. In any region, therefore, where a season of cold or of drouth comes regularly, many plants have developed as annuals and biennials, or, in other words, have developed the ephemeral habit. The perennial habit involves an unusual development of protective structures, which the ephemeral habit avoids.

Dur'ban, the seaport and, with Pietermaritzburg, the chief town, of Natal, South Africa. It is situated on a landlocked tidal bay, accessible for all vessels; a railroad runs inland from it throughout the colony. The town was laid out by a colony of Dutch burghers in 1842, and derives its name from Sir Benjamin D'Urban, once governor of the Cape. Pietermaritzburg, the capital (population 31 199), lies about 60 miles northwestward. Durban is one of the trade-gates of South Africa, and figured prominently as the landing-place of the British forces in Natal operating against the Boers. A large population of the town are Kafirs. The number of its inhabitants is 59,000.

Dürer (*dü'rĕr*), **Albrecht,** the most celebrated artist of Germany, was born at Nuremberg in 1471. He was apprenticed to a painter in his native town, and, some years later, after a period of travel, married and settled as a painter at Nuremberg. He soon after began designing on wood and engraving on copper, and many of these pieces still exist. In 1505 he proceeded to Venice, and after his return painted his *Adam and Eve*, which is now at Florence, and his *Assumption of the Virgin*, one of his finest works, but part of which has since been burned. He was much employed by Emperor Maximilian I. In 1520 he went to the Netherlands and painted the portrait of Erasmus, and while there he was appointed court-painter by Charles V. He died at Nuremberg in 1528. Besides being the greatest of German artists, Dürer ranks even higher as an engraver on metal and as a designer of woodcuts. The most celebrated of his copperplates are the *Little Passion* and *St. Jerome in His Study;* and of his woodcuts, *The Greater Passion*, *The Little Passion* and the *Apocalypse* are the best known. See *Albert Dürer*, by Thausing, English translation by F. A. Eaton.

Durham, John George Lambton, First Earl of, was born at London, April 12, 1792, was in the house of commons from 1813 to 1828, and lord of the privy seal in 1830. He aided in preparing the first reform-bill, was successively ambassador to Russia, Austria and Prussia, and was appointed high commissioner for the settlement of the troubles of Canada and governor-general of the British provinces in North America on March 31, 1838. He immediately set himself to ascertaining the causes of the widespread troubles. To each province he sent a commission of inquiry, and called into conference the governors of Nova Scotia, New Brunswick, Newfoundland and Prince Edward Island. It was then that the future confederation of the Canadian Dominion had its first great impetus. A scheme of union between Upper and Lower Canada was also worked out, and a masterly report on the condition of affairs prepared and presented to Parliament. The adverse criticism caused by his proclamations of amnesty led to his sudden resignation. He died at Cowes, on the Isle of Wight, July 28, 1840.

Durham (*dŭr'am*), an ancient English city, near the center of Durham County, is built around a steep rocky hill, which is nearly encircled by the River Wear. On the top of the hill, which is partly inclosed by old walls, are the castle and cathedral. Durham arose about 995, when a church was built to enshrine the bones of St. Cuthbert. In 1093, on the site of this old church, was commenced the present cathedral, one of the finest specimens of Norman architecture in Great Britain. The castle, once the residence of the bishops of Durham but now occupied by Durham University, was founded in 1072 by William the Conqueror, but has been much changed since. The dormitory of the monastery of Durham, now the university-library, is one of the finest in England. The bishopric of Durham extends over the entire county, and has had many celebrated men as bishops. The present university, which has a small attendance, was opened in 1833.

Duse, Eleonora (1859–), an Italian actress of note, was born at Vigevans, on the border of Piedmont and Lombardy, and first appeared on the stage when but 13. She early became a favorite with Italian playgoers, playing in Florence, Naples and Milan. Later on she appeared at Vienna, Berlin, Paris and London, achieving triumphs in various rôles, such as Juliet, Marguerite, Magda, Camille, Francesca da Rimini, Paula in *The Second Mrs. Tanqueray*, Santuzza in *La Cavalleria Rusticana*, etc., etc. In 1893 she appeared at New York as Camille. She revisited this country nine years later, where her talent and, especially, her great dramatic power were enthusiastically recognized and praised. In the Old World her triumphs have also been many and especially her acting of Mirandolina in Goldoni's *La Locandiera* and in the heroines of Gabriele d' Annunzio's *Gioconda* and his *Francesca da Rimini*.

Düsseldorf (*düs'sel-dôrf*), the chief town in the district of the same name in Rhenish Prussia, is situated on the right bank of the Rhine, at the mouth of the Düssel. The streets are large and regular and planted with trees, while the large number of squares and tasteful parks greatly helps the appearance of the city. Of late years the trade and industries of Düsseldorf have largely increased, the iron and cotton-industries being important, as are also manufactures of pianos, paper, soap and beer. The city is specially noted as a center of art. The Düsseldorf Academy, under the management of well-known artists, was celebrated during the first half of the 19th century. The art-hall contains a gallery of modern etchings. The famous picture-gallery, founded in 1590, was in part removed to Munich in 1805. Several of the churches are old and full of interest, and the city has one of the finest public gardens in Germany. Population, 357,702.

Dutch East India Company. This company was formed in 1602 by the union of several smaller companies to secure a monopoly of the Dutch trade to the East Indies. During the long war with Spain and Portugal the Dutch Company managed to deprive Portugal of all its possessions in the East Indies. The company established a valuable colony at the Cape of Good Hope; and took Ceylon from Portugal in 1658. In spite of English and French competition the Dutch Company was very successful, especially during the seventeenth century, when its dividends ranged from 12 to 63 *per cent*. But the proclamation of the Batavian Republic under French control in 1795 put an end to the existence of the company, which had during the 18th century at times required state-support. The English had already driven the Dutch Company from India and crippled its trade. But in 1815 many of the possessions of the Dutch East India Company were restored to Holland.

Dutch Republic, The, was founded by the union of the seven northern provinces of the Netherlands, during the long and heroic war against Spain for freedom of religion and government. These provinces, Holland, Zeeland, Utrecht, Gelderland, Groningen, Overyssel and Friesland, formed their union in 1579 and declared their independence in 1581. The war of liberation became a fierce crusade. The Netherlands had been a province of the German Empire under Charles V; but under Philip II they were no more than a province of Spain, and the rooted idea of Philip was to stamp out heresy from his dominions. In 1567 he sent the Duke of Alva with a Spanish army to the Netherlands; and among the victims of the persecution that followed were Counts Egmont and Hoorn. But in 1586 the Prince of Orange entered the field with a small army; and so began the forty years' struggle for freedom. At times the Dutch were helped by France, at times by England; but it was the great courage and faith of the people that in the end won their liberty. In 1581 William of Orange was made ruler of Holland and Zeeland; but in 1583 he was murdered at Delft. Maurice of Nassau, the son of William of Orange, at length won a decisive battle in 1600 at Nieuport. Meantime the Dutch fleets had seized the Portuguese and Spanish settlements in the East Indies. A 12 years' truce in 1609 practically granted the independence of the Dutch Republic, which entered upon a period of prosperous trade and of naval and commercial rivalry with England. The Dutch East India Company was founded in 1602; and the Dutch West India Company, which controlled New Netherlands (New York) in 1621.

After the 12 years' truce with Spain expired, war was renewed, but was ended in 1648 by the Peace of Westphalia. The greatest days of Holland were those of its naval successes against England in the wars of 1652 and 1665; but the English fleets in the end proved too strong. In 1688 the stadtholder of Holland was called to the throne of England as William III. Holland now became one of the foes of Louis XIV. Peace was only restored in 1713 by the Peace of Utrecht. Holland then began to be ousted by England from her trade. In 1780 she had a short war with England; and in 1782 was the second power to recognize the independence of the United States. Hitherto the Dutch Republic had been rather aristocratic; but in 1795 the French compelled Holland to accept a new republican constitution as the Batavian Republic. In 1806 Napoleon changed this form of government into the Kingdom of Holland under his brother Louis. In 1810 the country was annexed to France. But in 1813 the French were expelled and the House of Orange restored; and in 1815 Holland and Belgium were united. This was the end of the Dutch Republic. Belgium was made an independent kingdom in 1830.

Duties. See Tariff.

Dvina. See Dwina.

Dvorak (*dvôr zhäk*), **Antonin,** Bohemian composer, was born at Mühlhausen on the Moldau in 1841, and was the son of an inn-keeper. He learned music, it is said, first from the gypsies, but entered the Prague conservatory as bandsman and organist. In 1883 his famous *Stabat Mater*, produced in London in that year, first stamped him as a really great composer, and earned for him later the honorary degree from Cambridge of Doctor of Music. His *Spectre's Bride*, composed for the Birmingham festival of 1885, met with enthusiastic reception, as did his oratorio, *St. Ludmila*, composed for the Leeds festival (1886). In 1892 he wrote a four-act opera, *Dimitrij*, which was first produced in Vienna. In the same year he visited the United States, where he took the direction, for a while, of the National Conservatory of Music at New York, and while there wrote a cantata, entitled *Columbus*, which was produced at the Metropolitan Opera House, New York. His other works include dances, songs and symphonies, an opera, *Jacobin*, and a cantata, *The American Flag*. A further popular work of Dvorak's is *Der König und der Köhler* (The King and the Charcoal-Burner). He died in 1904.

ANTONIN DVORAK

Dwarf, name used especially for people much under the average size of mankind. The ancients believed there were races of dwarfs, and Aristotle declared that eye-witnesses affirmed that many of these little people lived in caves on the banks of the Nile. The most notable dwarf-races of men are the Bushmen, who are about four feet seven inches in height; the Akkas in Central Africa, about four feet ten inches high, by whom Stanley was much troubled in 1881; the Obongos on Gabun River; and the still smaller Batwas, about four feet three inches high. Other tribes of small stature are also reported. In the myths of the old Germanic nations dwarfs play a prominent part. They had their kings and lived in caves within the earth, where they kept treasure and works of art. Dwarfs used to be often kept as court-pets, and lately it has become common to exhibit them as curiosities in shows. The most famous of American dwarfs was Charles Stratton, called General Tom Thumb. When he married Miss Lavinia Warren, in 1863 he was 31 inches in height, his wife being one inch taller. With their child and another dwarf, called Commodore Nutt, they were exhibited through America and England. Flynn of New York, called General Mite, was only 21 inches high. Dwarfs are oftentimes strong for their size and quite intelligent. See *Giants and Dwarfs*, by E. J. Wood.

Dwight, Timothy, a well-known American theologian and educator, was born in 1752, at Northampton, Mass., and was a grandson of Jonathan Edwards. He studied at Yale College, was a chaplain in the American army during the Revolution, and settled as a minister at Greenfield Hill, Conn., where he also conducted an academy with great success. In 1795 he became president of Yale College. He died at New Haven, Conn., in 1817. His sermons on theology had a wide influence. See *Life of Timothy Dwight*, by W. B. Sprague, in Sparks' *American Biography*.

TIMOTHY DWIGHT

Dwight, Timothy, grandson of the preceding, was born at Norwich, Conn., in 1828, and elected president of Yale University in 1886. He was a member of the American committee for the revision of the English version of the Bible. He published in 1872 *The True Ideal of an American University*.

Dwina (*dwē'nȧ*), **Dvina** or **Düna,** the name of two important rivers of Russia. (1) The northern Dwina is formed by the coming together of the Sukhona and the Yuk. It flows in a general northwest direction through a flat country to the Gulf of Archangel. Its length is about 450 miles, and it has several large tributaries, the largest of which, the Viuchegda, is navigable for 500 miles. The river is a valuable channel of inland trade. (2) The western Dwina rises not far from the source of the Volga and the Dnieper, emptying into the Gulf of Riga. Its course is 500 miles long, part of which is navigable. It is connected with the Dnieper, and thus with the Black Sea, by the Beresina Canal, and by other systems with the Caspian Sea, the Neva and the Gulf of Finland.

Dyaks. See Borneo.

Dyment, Albert E., born at Lynden, County of Wentworth, Ontario, 1869. His father English, his mother Scotch. Educated at Barrie Collegiate Institute and at Upper Canada College. A prosperous manufacturer and dealer in lumber. Elected for Algoma to the House of Commons in 1896 and in 1900 and for

Algoma East in 1904. Is Honorary Lieutenant-Colonel of the 97th Regiment in 1907. A Liberal.

Dynam'ics is that science whose aim it is to describe most completely and most simply the motions which occur in nature. This is the definition given by Kirchhoff. But his illustrious colleague, Helmholtz, defines dynamics as the science of those phenomena in nature which may be reduced to the motion of ponderable masses. The difference between the two definitions is slight; and it vanishes completely if we assume that *all* the phenomena of nature can be explained, ultimately, in terms of matter in motion.

Perhaps the simplest method of getting a clear idea of the object and the method of dynamics is to consider the orderly sequence of steps by which this science, in its modern form, has been built up.

KINEMATICS

1. Before the motion of a particle can be described, we must be able to define the position of that particle: for motion is merely change of position. For this purpose dynamics makes use of the ordinary geometry of position. As is well known to everyone, when we wish to locate a point on the earth's surface, we must tell three things about it, namely, its latitude, its longitude and its height above the sea-level. So in dynamics it requires always three specifications (called co-ordinates) to locate a particle. Knowing how to locate points, one can then easily locate any rigid body. For if any three points (not in the same straight line) in such a body are fixed, the entire body itself is fixed.

2. The second step in dynamics is to describe the change of position or displacement in bodies. But since change of position is the same kind of quantity as position itself, we still use simply the geometry of position for this purpose.

3. The third step is to describe the rate of change of position. This introduces a new quantity, time. To measure time we use a body in uniform motion, that is, we use a body which is set in motion and let alone. The most uniform motion that we know anything about is the rotation of the earth on its axis. Accordingly the average period of rotation of the earth with respect to the sun is called a day. And 1-864,00th part of a day is called a second. This is the unit of time most frequently employed in dynamics. The idea of time being clear, the rate of motion or the velocity of a particle is defined as "the ratio of the change of position to the time occupied in this change." The numerical value of any velocity, without reference to its direction, is called its speed.

4. But since practically all velocities in nature are changing, the fourth step in dynamics is to define the rate of change of velocity. This is called acceleration, and is measured by the ratio of the change in velocity to the time occupied in the change.

Up to this point we have considered merely the motion of a body, but have not asked any questions concerning the causes of these motions. This science of motion alone is called kinematics, which is merely a Greek word for science of motion. Kinematics may be taken as a purely mathematical subject; but, as a matter of fact, it nearly always forms the first chapter of any treatise on dynamics.

DYNAMICS

5. Passing now to the thing in motion—that which we call matter—we find that the quantity of it can be measured just as it was in the case of time and space; but we cannot define it, any more than we could time or space. Time may be called duration and space may be called extension; but no one is any the wiser for all that. So the amount of matter in a body is called its mass; but this is not a definition of matter; it is merely a convenient name for the amount of substance in any body. The measure which is employed for matter is its *inertia*, that is, its tendency to remain at rest if it is at rest or to remain in motion if it be in motion. If one body is twice as hard to set in motion as another, it is said to have twice the inertia of the other, that is, twice the mass of the other. It was shown by Newton that all bodies, regardless of their chemical composition, are attracted by the earth with forces which are strictly proportional to their masses. And hence we use the balance when we wish to compare (*i. e.*, to measure) two masses.

These three ideas, mass, space and time, are the fundamental concepts of dynamics. Proceeding from these, Galileo, Huygens, Newton and Lavoisier constructed what might be called the first modern system of dynamics. The experimental facts which lie at the foundation of this system are Newton's laws of motion and Lavoisier's discovery of the conservation of matter.

NEWTON'S LAWS OF MOTION

Before these experimental facts can be stated in a clear and definite manner, it is essential to introduce two more fundamental quantities, viz., the linear momentum of any body, which is defined as the product of its mass by its velocity, and the force acting upon any body, which is defined as the product of its mass by its acceleration; or, what amounts to the same thing, the time-rate at which the linear momentum is changed. Newton's laws may now be stated as follows:

I. If a body is in translation under no external force, its linear momentum remains constant.

II. The change in the linear momentum of a body is proportional to the force acting upon the body; and the direction of the change is the same as the direction of the force.

III. Action is always equal and opposite to reaction; by which is meant that the mutual forces of any two bodies or of any two parts of a body are always equal and oppositely directed.

Lavoisier showed that the amount of matter in any isolated system cannot be increased or diminished by any known means: and therefore, presumably, that "the amount of matter in the universe is a constant."

6. The next great step in dynamics is the introduction of the idea of work and energy. Work, in dynamics, is employed to denote one definite quantity, viz.: the product of a force multiplied by the distance through which it is exerted, both distance and force being measured in the same direction; while energy is defined simply as the ability to do work, and is, therefore, measured in the same units as work.

By 1847 Helmholtz, together with a number of his contemporaries, had proved that though the energy which a system of bodies possesses may assume a great variety of forms, yet the amount of that energy is a constant quantity. The energy of the universe is continually undergoing transformation; but there is no evidence for thinking that the slightest bit of energy has ever been annihiliated or created by man. This summary is known as the principle of the conservation of energy. Nearly all the problems of dynamics are solved by applying to the particular case in question either Newton's laws of motion or the law of the conservation of energy.

DYNAMICS OF ROTATION

7. A very great simplification in the treatment of dynamical problems is secured by the fact that all cases in rotation may be solved not only by the same principles, but by the same formulæ, as in the case of translation.

We have only to replace linear displacement, x, by angular displacement, θ; and linear inertia, m, by rotational inertia, I. The following table gives a summary of the principal quantities involved in translation and rotation, and shows that they are identical in form in the two cases:

TRANSLATION		ROTATION	
Inertia (=Mass)	m	Rotational inertia = moment of inertia	I
Linear Displacement = change of position	x	Angular Displacement	θ
Time	t	Time	t
Linear Velocity	$v=\frac{x}{t}$	Angular Velocity	$\omega=\frac{\theta}{t}$
Linear Acceleration	$a=\frac{v}{t}$	Angular Acceleration	$\gamma=\frac{\omega}{t}$
Linear Momentum	$M=mv$	Angular Momentum	$G=I\omega$
Force	$F=ma$	Moment of Force	$L=I\gamma$
Energy of Translation	$E=\frac{1}{2}mv^2$	Energy of Rotation	$E=\frac{1}{2}I\omega^2$

8. Up to this point we have no principle which will determine the direction in which any dynamical process occurs. The law of the conservation of energy would be equally well-satisfied whether a clock-weight ran down and delivered energy to the clock-train and the air, or whether the clock-weight ran up, deriving the necessary energy from the heat in the train and in the air. It has been found convenient to divide all kinds of energy into two groups—energy of position and energy of motion—called potential and kinetic energy respectively. And it has been discovered by Clausius, Kelvin, Helmholtz and others that, in general, "the potential energy of any system tends to become a minimum." Armed with this theorem, which is, perhaps, the most general principle of dynamics, we are prepared for the solution of all the ordinary problems of mechanics. The method in general consists in writing, in the form of equations, the six conditions of equilibrium, namely, that all the forces shall be zero and that all the moments of force shall be zero, and then solving for the quantity desired.

Upon the eight general principles enunciated above are constructed the entire superstructures of astronomy, physics and mechanical engineering.

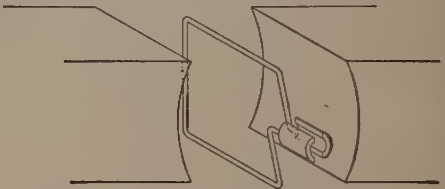
For the history of the subject see Mach's *Science of Mechanics*, translated by McCormack; for the laws of motion see Tait's *Newton's Laws of Motion;* for a treatment of rotation see Worthington's *Dynamics of Rotation.*

Dynamite, from a Greek word meaning strength, is produced by mixing nitroglycerine with a kind of earth, known under its German name of *keiselguhr.* Nitroglycerine was discovered in 1846, but it was not till 20 years after that the experiments of Alfred Nobel, who combined it with the earth just mentioned, made it of practical importance. Dynamite has a reddish-brown color, and is about one part earth to three parts nitro-glycerine. It burns with a yellowish flame and, in small quantities, without danger. The time of an explosion of a dynamite-cartridge is about the 24,000th part of a second. Dynamite is much used for breaking up bowlders, and is used under water as well as on land, the water causing the loss of only six *per cent.* of its power. For quarrying purposes gunpowder is generally used, as dynamite breaks up rock too much. Dynamite is also used in explosive shells that may be fired from guns of special construction, a dynamite gun having been invented in 1883. Unfortunately, it has been also employed for the destruction of life and property.

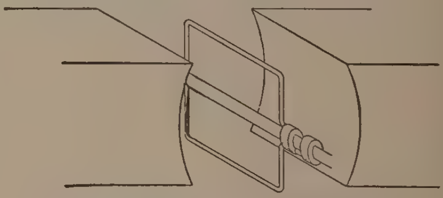
Dynamo. See ELECTRICITY.

Dynamo-Electric Machine or, simply, dynamo, a machine for generating an electric current in a conductor by moving the conductor in the magnetic field of a magnet or system of magnets. The motion is relative, that is, either the conductor or the magnet may be the moving part. All dynamos are based upon the fundamental discovery made by Michael Faraday in 1831. Faraday discovered that, if a wire forming a part of a circuit is moved across the space (called a magnetic field) in front of the pole of a magnet, an electric current will be set up in the wire and circuit during time of motion. The modern dynamo consists of two essential parts: (1) an electromagnet or system of electro-magnets called the field-magnets and (2) a system of copper wires, usually wound on a laminated iron core. This system of conductors is called the armature, and is the part in which the current is generated. In most varieties of dynamos the armature revolves in the magnetic field of the field-magnets, but in many large alternating-current dynamos the field-magnets form the revolving part.

Dynamos are divided into two general kinds: direct current (D. C.) and alternating-current dynamos (A. C.) or simply alternators. The current generated in the circuit of a D. C. dynamo is constant in direction and magnitude. The current produced by an alternator reverses direction at regular intervals. All commercial D. C. dynamos have a commutator. This is a metal cylinder built up of a number of insulated sectors or bars, which revolves with the shaft on the armature. Fixed conducting-brushes rest against this commutator and make the connections with the external circuit. The armature-coils are connected with the commutator-bars, so that the connections with the external circuit are reversed as often as the current in the armature is reversed. In this way the current in the external circuit is kept constant in direction. The collecting device for a simple A. C. dynamo consists of two insulated copper-rings on which the brushes rest. The current in the external circuit is thus reversed as often as the current in the armature-coil is reversed. The common number of alternations or reversals (often called cycles) in commercial alternators is either 125 or 60, but as low as 25 are used in the Niagara Falls electric plant.



SIMPLE DIRECT CURRENT DYNAMO

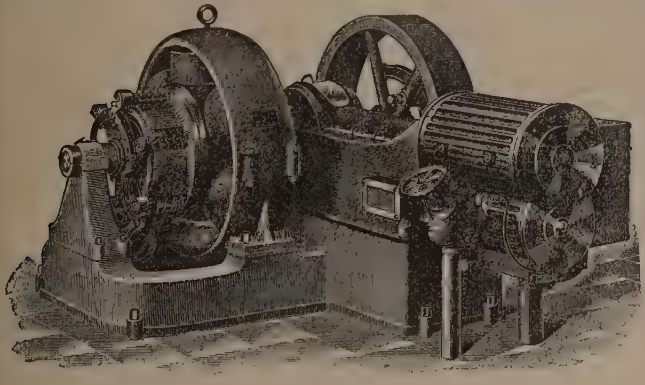


SIMPLE ALTERNATING CURRENT DYNAMO

Alternators are often built to generate two or more alternating currents, which differ in "phase." Such machines are called two- or three-phase alternators. Thus a two-phase machine is one which generates two separate alternating currents, the two currents differing in that the first reaches its maximum when the second is at zero, and when the second reaches a maximum the first is passing through its zero, and so on. Apparatus generating and using two or more phases is called polyphase apparatus.

The use of alternating currents has increased largely within the last 15 years, because of the inventions of transformers and of the induction-motor. The polyphase alternating-current system is the only one commercially feasible for long-distance transmission of electric energy (see TRANSFORMERS and TRANSMISSION OF POWER), and even for many shorter lines there are engineering advantages in its use. The field-magnets of some of the earlier dynamos were permanent steel magnets, and such machines were called magneto-electric machines or magnetos. The little dynamos used in telephone call-boxes are magnetos. The field-magnets of all modern machines are electro-magnets. The machine is spoken of as bipolar or multipolar, according as the field-magnet system has two or more poles. The field-magnets of most alternators are separately excited by an electric current from a small auxiliary dynamo called the exciter. The field-magnets of most D. C. dynamos are excited by the current generated by the dynamo itself. If all the current of the armature passes through the field-coils, the dynamo is said to be a series-wound machine; if only a fraction of the armature-current goes through the field-coil, the dynamo is a shunt-wound machine. When there are two sets of field-coils, a series-set and a shunt-set, the dynamo is said to be compound-wound. The choice of the kind of field-windings is a question of regulation of the current-output with different loads.

Dynamos are rated in kilowatts as steam-engines are rated in horse-power. A kilowatt (K. W.) is almost exactly equal to one and one third H. P. Thus a 75 K. W. dynamo has the same work-capacity as a 100 H. P. steam-engine. To get the K. W. of a dynamo, divide the product of the volts and amperes by 1,000. The use of electrical machinery for power-purposes has made a demand for large dynamos, often reaching several thousand K. W. for one machine. Thus in the Niagara Falls plant there are ten machines, each of 5,000 K. W. output.

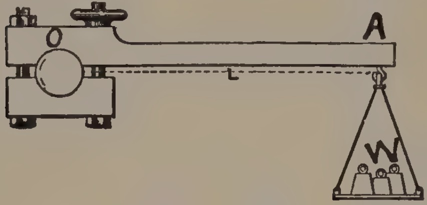


DIRECT CONNECTED DYNAMO AND ENGINE

Faraday and others saw immediately that his discovery of electromagnetic induction (1831) could be used for the continuous production of electric currents, but the modern machine was evolved slowly and represents the added ideas of more than a generation of inventors. The first machine had permanent magnets. In 1832 Pixii devised a commutator. In 1848 Brett suggested the self-exciting electromagnet for the field. The name dynamo-electric machine was first given by Dr. Werner Siemens in a paper read before the Berlin academy in 1867. In 1870 Gramme invented the ring-armature, and three years later Hefner-Alteneck improved the early form of Siemens armature and gave us the present drum-armature. The ring- and drum-armatures have been used more than any others in D. C. dynamos. The theory of the dynamo-machine has been studied carefully by Hopkinson, Frölich, Kapp, S. P. Thompson and others, so that the designing of a dynamo for any specific purpose has been reduced to a question of exact calculation. The efficiency of modern dynamos is often 96 to 98 *per cent*. The largest makers of dynamo-electric machinery in the United States are the General Electric Company, the Westinghouse Electric and Manufacturing Co. and the Stanley Electric Manufacturing Co. The shops of these companies are among the largest manufacturing-plants of any kind in the world.

A. P. CARMAN.

Dy'namom'eter, strictly an instrument to measure a force tending to produce motion. Thus, a spring-balance is sometimes called a dynamometer. The term, however, is commonly applied to an instrument to measure power. Power is rate of doing work. Work is force overcome through distance. The unit of work used in engineering is the work done in raising a pound-weight one foot against gravity, called a foot-pound. When a machine does work at the rate of 33,000 foot-pounds in one minute, the power is one horse-power (H. P.). The power-unit used by electricians is a kilowatt (K. W.), equal to $1\frac{1}{3}$ H. P. A dynamometer is technically used in engineering for any device which measues H. P. One of the simplest and most common forms is the Prony brake. A block B is clamped fairly tight on the pulley O of the machine. The machine then does work against friction. The force is balanced by the weight W on the lever-arm AO. From the speed of rotation, the lever-arm and the force W, the power is directly calculated. For the many forms of dynamometers, see J. J. Flather's text-book on *Dynamometers*. A wattmeter measures electrical power in watts. It is an instrument for measuring the product of the pressure (volts) and current (ampères), which gives the watts directly. The best known forms are those of Siemens and the modified forms of Weston.



PRONY BRAKE

Dyne (*dīn*), the unit of force employed in the metric system. It is defined as that force which, acting upon a mass of one gram, will produce unit-acceleration. If we denote the acceleration of gravity by *g*, then the weight of one gram is equal to *g* dynes. And, in general, we may say that the weight, W, of any body whose mass is *m* grams is *mg* dynes, or

$$w = mg \text{ dynes}.$$

A definition of the dyne which is exactly equivalent to that given above is the following: That force which, acting for one second, will produce unit-change of velocity in a mass of one gram. A *megadyne* is a force of one million dynes, and is about two *per cent.* greater than the weight of a kilogram.

E

E, the fifth letter, is a vowel. It represents seven sounds, the principal ones being the long sound in *eve* and the short sound in *best*. Variations of long *e* are heard in *event* and *eight*, of the short *e* in *excuse* and *horses*, the absence of accent on these *e's* affecting their quality. Other *e* sounds occur in *ever*, *where*, *whereby*. *E* at the end of words usually is silent, but indicates that the preceding vowel is long, as in *came*. Final *e* after *c* and *g*, as in *lace* and *rage*, shows that *c* is *s* and *g* is *j*. *E* occurs in English words far more frequently than any other letter. Its *ā* sound comes from the Latin.

Eads (*ēdz*), **James Buchanan.** Men with genius for mechanics, as for art, usually give indication of it very early in life. This famous engineer, who built the Eads bridge across the Mississippi at St. Louis, constructed models of saw-mills, fire-engines and steamboats before he was ten years old. He was born at Lawrenceburg Indiana, in 1820. This was before the day of railroads. The commerce of the country was carried on over the waterways, and the Ohio swarmed with every kind of boat that was in use. Perhaps this is the reason the man came to be identified with rivers; the deepening of their channels the bridging of them, the construction of boats, the protection of their banks from erosion.

When he was 13 the family moved to St. Louis, where river life was on a larger, more dramatic scale. One of the first things he did to attract attention was the raising of wrecked boats, for which work he invented improved hoisting-machinery. When the Civil War broke out, he was called to Washington and given a commission to build iron-clad gunboats to patrol the Mississippi. His feat of building and equipping eight such boats in 100 days gave him world-wide fame. From 1867 to 1874 he was engaged in bridging the Mississippi. The Eads bridge is still considered the finest example of metal-arch construction in existence. His next undertaking was the improvement of the South Pass of the Mississippi delta by the use of jetties. Congress approved of his plans to introduce the jetties all the way up to the mouth of the Ohio, but the cost was enormous and the work was never completed. Mr. Eads also proposed to build a ship-railway and then a ship-canal across the Isthmus of Tehuantepec, Mexico. Had he lived, this route might have been adopted rather than Panama. He died at Nassau, Bahama Island, March 8, 1887. He received the Albert medal from Queen Victoria and many other decorations and honors from governments and universities. His ashes were scattered on the flood-waters of the Mississippi, according to his will, from the Eads bridge, his only monument.

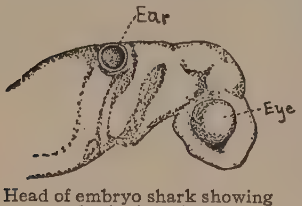
Eagle, a large bird of prey, related to buzzards and vultures. There are forty or fifty species of eagles in all countries of the world, but only two kinds occur in North America. These are the golden eagle, common to Europe, Asia and America, and the baldheaded eagle, which is peculiar to North America. The golden eagle is a magnificent, mountain-loving bird; it is found in the United States from Mexico northward, but is far from common. It is more abundant in the Old World, but there the sea-eagle is a more common bird. The golden eagle is a large bird of brownish color, the feathers of the head and neck appearing golden in the sunlight. It attains a length of three and one half feet, and nine feet in spread of the wings. Its food is hares, ducks, lambs, small pigs and the young of other animals, which it carries away in its talons. It lays two or three whitish eggs with brown spots, usually on inaccessible cliffs. The baldheaded eagle belongs to the group of the sea-eagles and lives near water; it is found on rivers

IMPERIAL EAGLE

and lakes and especially along the sea-coast. It is slightly smaller than the golden eagle, having an expanse of wing of about eight feet. The feathers on the head and upper part of the neck are white, which gives it the name of baldheaded. It feeds largely on fish, sometimes catching them for itself, but, when opportunity offers robbing the fish-hawk or osprey. It frightens the osprey into dropping the fish which it has caught, and then catches it in its own claws before it reaches the earth. These birds usually nest in high trees, and lay two eggs of dull white color. Among other varieties are the harpy-eagle, the serpent-eating eagle, etc. Eagles are supposed to attain a great age. They have long stood as the emblems of war and power, and have been the standards of war in several countries. The famous war-eagle of the United States — Old Abe — was stuffed and preserved in the state-library at Madison, Wis.

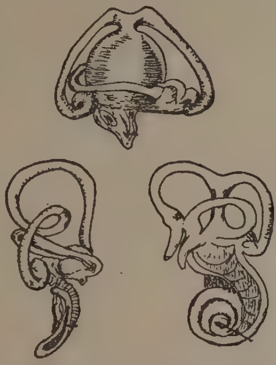
Eames, Emma (Mrs. Julian Story), American soprano singer, also famed for her beauty, was born at Shanghai, China, Aug. 13, 1867, and is the daughter of an American lawyer then employed in the international courts at Shanghai. Her early years were spent at Bath, Me., her musical studies being directed by her mother, and under instruction in Boston. In 1886 she proceeded to Paris, where she was a pupil of Mme. Marchesi, and appeared in 1888 at the *Opéra Comique*, and in the following year made her debut in grand opera in Gounod's *Romeo et Juliette*. She sang with Mme. Patti and with the brothers De Reszke, and met with great success. In England she appeared at the Covent Garden theatre, London, in her impersonation of *Marguerite*. In the United States she added to her high reputation as a prima-donna, and won fresh laurels under Herr Grau, in her famous operatic parts, including Wagnerian rôles. Her repertoire is extensive, and not only English but in French, German and Italian. In 1891 she married a son of W. W. Story, the well-known American poet and sculptor. In 1908 they divorced, and she now resides in Paris, France.

Ear, the organ of hearing, especially adapted to receive sound-vibrations from the air. The ear is merely the receiver; it must of course be connected with the brain by the nerve, otherwise there is no hearing. The parts of the ear are thrown into vibration by the sound-waves, and these vibrations are conveyed by the nerves to the brain. If the nerves are destroyed and all the other parts left perfect and uninjured, there, nevertheless, is no hearing. Receiving organs of this kind are placed on the surface in order that they may be in contact with the external world. They are called end-organs or sense-organs. The ear is one, the organs of sight, smell, taste and touch are others. Ears are found very low in the scale of animal life. In the simpler forms they consist of little bags filled with fluid, in which are small, hard particles called ear-sand or ear-stones. The shaking of the bag causes the fluid to vibrate, and the ear-sand is also put in motion, which increases the effect upon the nerves of hearing. In all the vertebrated animals the ear, in common with the other sense-organs, begins on the surface as a patch of the outer cell-layer. There are two round patches on each side of the head, which become sunk in like small saucers (see illustration). The ear starts in this way in all fishes, amphibia, reptiles, birds and mammals. In this stage it is called the ear-saucer or ear-pit. Soon it begins to close by the growth of the skin over it; it becomes a sort of pocket, at first open and then closed, after which it is called the ear-vesicle. From this ear-vesicle, which is little more than a sac, arise gradually all the other parts of the inner ear. In the higher animals three parts are recognized: an outer, a middle and an inner ear. The outer ear includes the part that can be seen and the tube leading inward from the surface. Ear-wax is formed within the tube, and a membrane is stretched across its inner end, called the tympanic membrane. The middle ear is a space filled with air, bounded by the membrane on the outside and the bony wall of the internal ear on the inside. The space is crossed by a chain of three small bones, called the hammer, the anvil and the stirrup. The hammer is fastened to the tympanic membrane, and the stapes to a small oval membrane which covers one of the small openings through the bone into the bony cavity that contains the inner ear. The cavity of the middle ear also communicates with the throat through a passage called the Eustachian tube.



Head of embryo shark showing beginning of ear

In reptiles and birds there is a single long bone in the middle ear, instead of three bones as in the higher animals. The inner ear is the essential part, in fishes the only part. The middle ear is gradually developed and the external ear added to it as we go up the scale of animal-life above the fishes. The inner ear consists of an upper portion from which three semicircular canals arise, and an inner part which in the higher animals is coiled like a snail-shell and called the cochlea; but this part is fully developed only in mammals (see illustration). The illustration shows the inner ear of a reptile, a bird and an ox. Notice that in the reptile there is no cochlea, only a small projection in place of it; in the bird this projection is longer and curved; and in the ox it has become long and coiled like a snail-shell — the true cochlea. The semicircular canals are present in all three. It is in the cochlea that the most complicated structures are found. The principal branch of the ear-nerve enters here, and becomes connected with certain large cells provided with hairs that vibrate when sound-waves reach them. The whole is inclosed in very hard bone, so that there are a bony part and a membranous part to the internal ear. The membranous part consists of closed sacs full of fluid, and these are also surrounded by a fluid. Thus the arrangement is exactly suited to receive vibrations and transmit them to the ear-nerves. In the cochlea are many little organs, standing side by side on a membrane and forming an arch or tunnel by arching toward each other. These are the organs of Corti. They vary in size, and possibly respond to different sets of sound-vibrations; but, on the other hand, it is possible that they simply act as dampers, somewhat like those in a piano, to prevent the too long vibration of the parts of the membrane upon which they rest. For fuller descriptions of the ear see text-books on anatomy and physiology. See, also, SOUND.


The inner ear of a reptile (above), a bird (to the left), and an ox (to the right)

Early (ẽr'lĭ), **Jubal Anderson,** a Confederate general, was born in Virginia in 1816. He graduated at West Point and served in the Florida and Mexican Wars, and was practicing law when the Civil War broke out. He entered the Confederate service as a colonel, and was in the battles of Bull Run, Fredericksburg and Gettysburg. He was defeated by Sheridan in several battles and also by Custer at Waynesboro, after which he was relieved of his command. He died at Lynchburg, Va., March 2, 1894.

JUBAL A. EARLY

Earth is the name given to the third planet in order from the sun. Like other members of the solar system, it revolves in an elliptical orbit, in one focus of which is the sun. The average distance of the earth from the sun is 92,800,000 miles. The earth has one moon, at a mean distance of 238,800 miles. It was anciently believed that the earth was a flat disk of land surrounded by water. It is now known that it has approximately the form of a sphere. On a wide, smooth surface, such as the sea, the upper part of a distant receding object, as a ship, remains in sight after the lower part has disappeared. This could be true only if the earth were round. The position of the stars shows the same thing. If one travels south, new stars, which before could not be seen, rise into view. Another very convincing proof is the fact that vessels steering always in the same general direction have gone round the earth, coming back to the point from which they started. The earth is not a perfect sphere, but is flattened slightly at the poles. If it were a perfect sphere, the arc of the surface, corresponding to a definite angle at the earth's center, would be equal in every part of the circumference. But it is found that an angle of one degree has a longer arc toward the north and toward the south than near the equator, thus showing that the polar regions are flattened and the equatorial regions bulge out. Delicate experiments also show that the force of gravity is greater near the poles than at the equator; but this can be true only if the center of the earth is closer to the other attracting body at the poles than at the equator; that is, the polar regions must be flattened so as to lie nearer the earth's center than is the equator. The shorter diameter of the earth is 7,899.6 miles, while the equatorial diameter is 7,926.6 miles. The character of the earth's interior can be inferred from certain tidal phenomena which have led Lord Kelvin to the conclusion that the rigidity of the earth is greater than that of glass. Estimates regarding the age of the earth vary enormously. Kelvin places it somewhere between 20 million and 400 million years.

The earth has four principal motions: that of rotation on its own axis; that of revolution around the sun; that of precession; and that of nutation. As it rotates on its axis half is always exposed to the sunlight and half is always in darkness, one rotation being made every 24 hours. The time taken for the revolution of the earth around the sun is 365¼ days, and forms our year. If its axis were exactly perpendicular, the days would always be the same length. But in fact its axis is inclined at an angle of 23½°; and thus, when the northern end of the axis is directed away from the sun, the rays of light and heat do not reach it, but, on the other hand, the sun's rays continually shine upon the southern end. This period is the winter of the northern hemisphere. When the earth has moved a quarter of the way around its orbit, the sun's rays reach both the north and south poles. At the end of the second quarter of its revolution—or the summer solstice—the northern end of the axis is inclined toward the sun, and thus is continually lighted; while at the third quarter of the revolution once more the light reaches both poles. In the first position, the further north we go the shorter is the time during which the sun's rays touch any one point, and thus the days are short and the nights long; and, as the days are short and the sun shines only for a short time, the weather is cold. This is the season of winter. Now, as the earth moves through the first quarter of its orbit, the days become longer on the northern hemisphere and shorter in the southern, till they become just equal about the 21st of March. This is called the spring-equinox. At the end of the second quarter the days are long in the north, the nights short and the season therefore warm; and at the third quarter once more the length of days and nights becomes equal, about September 23. At the summer-solstice of the northern hemisphere, when the north pole is inclined toward the sun, sunlight falls 23½° beyond the pole, and, as the earth rotates, all this region remains in daylight the whole 24 hours. At this time the south pole is turned away from the sun to the same extent. The circles bounding these regions of continuous daylight or darkness at the solstices are called the Arctic and Antarctic circles, and the spaces within them the north and south frigid zones. At the same time the sun is vertical at a distance of 23½° north of the equator. This is the highest northern latitude at which the vertical sun is experienced, and is called the tropic of Cancer, from the constellation in which the sun appears at that time. At the winter-solstice of the northern hemisphere the sun is vertical at a distance of 23½° south of the equator, or on the tropic of Capricorn. As the sun appears overhead in all places between these tropics twice in the year, and thus exerts its greatest heating power, this broad belt of the earth is called the torrid zone. The belts between the tropics and the polar circles are called the northern and southern temperate zones.

The sun's heat is constantly at work breaking down the higher rocks and spreading the broken matter as soil over the lower ground. The circulation of water is the great instrument for this work: vapor raised from the oceans and carried by winds is condensed as rain on the highlands, and, returning to the sea in the forms of springs and streams, has a chief share in wearing down the surface of the land. This process would finally reduce the land to a common low level, were it not counteracted by the continual gentle elevations and depressions of the surface, due to internal changes. Animal and vegetable life is spread all over the globe and has had a large share in producing the condition and aspect of many parts of the earth, as is witnessed by the great coal-fields of the earth, the chalk, limestone and marble found in many regions and the coral reefs and islands of tropical seas. Man, too, has helped to change the appearance of the face of the earth.

The average density of the earth is about five and one half times as great as that of water. Since the density of the earth's crust is very much less than this, it is not unlikely that the interior of the earth has a density as high as 7 or 8 and that it is composed largely of metals.

Some of the articles which will be useful in this connection are AFRICA, AMERICA, AUSTRALIA, EARTHQUAKE, EUROPE, GEOLOGY, GLACIERS, GRAVITATION, PACIFIC, PLANETS, SUN, TIDES, VOLCANO.

Earthquake, a name given to any very considerable and very sudden disturbance of the earth's crust. Since the late Lord Kelvin showed that the earth is more rigid than steel, it is not surprising that a disturbance at any point in the earth's crust should be propagated rapidly to distant parts of the earth. Concerning the character of the original disturbance very little is known; the slipping of one layer of rock over another and the falling of great masses in the interior of a mountain or volcano have been suggested. But concerning the vibrations which are propagated from one part of the earth to another a great deal has been learned within the last few years by means of the seismograph, an instrument which records both the character and the time of the disturbance at any one point. The principle upon which these seismographs are constructed is simply that of an ordinary gate standing halfway open. If the post to which the gate is hinged be shaken to and fro, the center of gyration of the gate will remain fixed If now a style be attached to the gate, it will trace out a line on the ground (which moves with the post); and this line will be a description of the displacement perpendicular to the direction of the gate. Now, a typical seismograph contains two open gates with heavy masses at the outer ends, each gate being at right angles to the other so that both components of any horizontal disturbance are obtained. A third heavy mass capable of motion only in a vertical direction records the vertical disturbance. By recording the same disturbance at two different stations it is frequently possible to compute the speed of earthquake-waves. Seismographs are now made of such delicacy that Professor John Milne has succeeded in England in observing earthquakes which had their origin in Japan. The destructiveness of an earthquake is not measured by the amplitude of the disturbance of the particles of the earth at any point but by the speed of these particles. A small to-and-fro motion may be very disastrous if it is rapid; while, on the contrary, a large displacement may be harmless if the motion is very slow. Two of the most disastrous historic earthquakes include one in Sicily, in 1693, which engulfed some 100,000 persons, and one at Yeddo, which proved destructive to 200,000 inhabitants.

Among some of the more important earthquakes of recent times the following may be mentioned:

In 1745 Callao in Peru was destroyed by a severe earthquake, at which time 220 shocks were recorded in 24 hours. A vast tidal wave rose 80 feet and swept over the town. In 1755 occurred the famous Lisbon earthquake. In this case also a great tidal wave was the most disastrous feature. When the wave subsided the city took fire, and within a few hours between 30,000 and 40,000 persons lost their lives. In 1783 Calabria and in 1779 Quito suffered from severe earthquakes, entailing a loss of life exceding 100,000. In 1811 the town of New Madrid, on the lower Mississippi, was terribly shaken, the earth undulating for a distance of 300 miles. Almost at the same time Carácas, in Venezuela, was overthrown and 12,000 of its inhabitants buried beneath the ruins. In 1822 Aleppo, in 1857 Calabria, in 1860 Mendoza in the Argentines and in 1861 Peru and Ecuador were frightfully afflicted. Again, in 1883, the island of Krakatoa in Sunda Strait was visited by a volcanic eruption which cost the lives of more than 35,000. That same year the isle of Ischia near Naples suffered a severe shock, which completely ruined four towns and destroyed 2,800 people. In 1886, on the night of Aug. 31, five destructive shocks were experienced at Charleston, S. C. Crevices were opened several yards in length and a few inches wide, some of which threw out water to a height of several feet.

On the 28th of October, 1891, occurred the great Japanese earthquake. The shocks were felt over almost the whole of the island of Nippon. The principal shock, while lasting only two minutes, was extremely destructive. The volcanic Mt. Haku-San shot out masses of stone and mud. Cracks and fissures opened, and in some places the ground subsided. The top of the sacred Mt. Fujiyama was torn asunder, and a chasm 1,200 feet wide and 600 feet deep formed. It is estimated that 6,500 persons were killed and 9,000 injured, while 75,000 houses were destroyed and 12,000 damaged. The more recent earthquake-disturbances are those in 1896 in Japan, involving a loss of 26,000 lives; in 1905 in India, involving a loss of 15,000 lives; the disastrous upheaval at San Francisco, on the 19th of April, 1906, followed by the burning of a large portion of the city; and the partial destruction of Valparaiso, Chile, in August, 1906. When the city was devastated, property to the value of $200,000,000 was destroyed and there was an appalling loss of life.

A most destructive earthquake occurred in southern Italy Dec. 28, 1908. The city of Messina in Sicily was entirely destroyed, with 60,000 dead and 80,000 injured. Reggio in Calabria and numerous smaller places were badly damaged. The total loss of life was over 76,000.

Earthworm, the common angleworm that burrows in the earth. The surface of the body is provided with small bristles which aid in crawling and in burrowing. The body is divided by furrows into a number of rings; those in front are larger than those in the middle and those behind are flatter, so that one can easily tell the head-end and the tail-end. The earthworm, although to general appearances so low in the scale of life, is wonderfully constructed, and is provided with organs of digestion, circulation, nervous life, etc. The digestive system is a muscular tube running through the body, having a crop and gizzard in its course; the front end of it is capable of being thrown out and drawn by a set of muscles. The food consists of animal and vegetable matter mixed with the soil, for example, minute fragments of old leaves, etc. Therefore the earthworm fills its alimentary tube with earth in which are scattered particles of animal and vegetable matter. The food is digested and absorbed into the system and the earth is voided again. In this way these worms work the soil over, and their influence is greater than one would at first suspect. Darwin showed that in an acre of garden, on an average, as much as fifteen tons of soil would pass through their bodies in a year. They also bring vegetable mould to the surface, and bury objects thrown upon the ground, at the rate of two inches or more in ten years. They have been important agents in burying ancient cities, temples, columns, coins, etc. They also are very beneficial to the soil in loosening it and working it over. They have a set of coiled tubes, a pair in each joint, except the first three or four, that remove from the body the worn-out material, and correspond to the kidneys of higher animals. These organs are characteristic of worms. The nervous system consists of a mass of gray nervous matter in the head, united by strands around the throat to a long cord of nervous matter running along the under surface of the body. The nerve-trunks are connected with this central cord, those of the head-end uniting with the brain, those from the rest of the body with the ventral cord. The earthworms have no eyes, but the entire fore end of the body is sensitive to light. They feed mostly at night, crawling from their burrows, and their places may be discovered by tubular castings of earth. There are many other worms composed, like the earthworms, of a series of rings. It is probable that the parentage of vertebrated animals was from simple animals somewhat like these ringed worms. No one thinks that the worms of to-day represent the ancestors of vertebrates, but it is generally believed by naturalists that the vertebrated animal came from very simple forms many thousand or million years ago, and those early remote parents were probably in structure somewhat like the living ringed worms. See Darwin: *Formation of Vegetable Mould.*

Easter, the festival of the resurrection of Jesus Christ, probably derives its name from Eastre, a Saxon goddess, whose festival was kept about the same time as Easter. In the ancient church, the celebration lasted eight days, but in later times it was limited to two or three days. It was a festival of pleasure; alms were given to the poor and slaves were often freed. Daily services were held during the whole week before Easter, and on Easter Day the people greeted each other with a kiss, saying: "He is risen," to which the reply was made: "He is risen, indeed;" and this custom is still kept up in the Greek church. The custom of exchanging eggs as a symbol of resurrection or renewed life is very old. Easter Day is always the first Sunday after that full moon which comes upon or next after the 21st of March (the beginning of the old church-year), the full moon being understood to be (though not accurately) the 14th of the calendar moon. If the full moon comes on Sunday, Easter Day always is the Sunday after.

Eastern Empire. See ROME and BYZANTINE EMPIRE.

Eastern Townships. This name is applied to a large portion of southern and eastern Quebec, lying between the American frontier and the older French settlements on the St. Lawrence River. It was populated by United Empire Loyalists after their expulsion and voluntary exile from the United States upon the conclusion of peace with the mother-country in 1783, and forms a distinctively English element in the French province.

East India Company. The East India trade dates from the time when the Portuguese navigator, Vasco da Gama, having effected the eastern passage to India by doubling the Cape of Good Hope, cast anchor off the city of Calicut, May 20, 1498. Though the Portuguese did not start a formal trading-company, they held sway in the seas they had opened during the whole of the 16th century. In the next century their place was rapidly taken by the Dutch, whose first vessel had rounded the Cape in 1596 and whose East India Company was founded in 1602. But the earliest incorporated East India Company was the English, to which Queen Elizabeth granted a charter on the last day of the 16th century. Several later English companies, after a brief period of rivalry, were united with the original company under the title of The United Company of Merchants of England Trading to the East Indies. In the 17th century the Dutch crowded the English out of the islands where all the European powers had gained their first footing, and so settlements were founded by the English on the coasts of the Indian peninsula. Madras, Bombay and Calcutta were founded one after the other. Properly speaking, the company were only merchants exchanging the products of the east and west, but soon they were drawn into the quarrels among the native princes, which resulted in the establishment by England of sovereign powers over vast regions. The charter of this company was renewed again and again, but a feeling against the monopoly gradually grew up in England. In 1833 the company's exclusive trading-privileges were taken away, and from that time the government took a constantly increasing part both in trading and in governing the Indian dominion, though it was nominally done by the company. In 1858, after the Sepoy rebellion, the company was forced after great resistance to yield its powers to the crown; and Indian affairs are now managed by a secretary of state for India. French and Danish East India Companies have existed for short periods. See INDIA; and *India under British Rule*, by J. T. Wheeler.

East Indies, as distinguished from West Indies, include the two great peninsulas of southern Asia and all the neighboring islands from the delta of the Indus to the northern extremity of the Philippines. See INDIA and, for the Dutch East Indies, HOLLAND.

East′lake, Sir Charles Lock, a celebrated English artist, president of the Royal Academy, was born at Plymouth in 1793, and studied in London and Paris. He lived for some time at Rome, where he painted several pictures which attracted attention in England. In 1841 his great work, *Christ Weeping over Jerusalem*, was painted. He was elected president of the Royal Academy, and was knighted in 1850.

During a journey in search of pictures for the National Gallery, of which he was a director, he died at Pisa, Italy, in 1865. Eastlake gained a high reputation as a writer on art. Besides other works he published *Materials for the History of Oil-Painting* and a number of papers now published in *Contributions to the Literature of the Fine Arts.* See *Memoir* by Lady Eastlake, prefixed to the second series of his *Contributions.*

East Liverpool, O., a growing town in southeastern Ohio, whose trade chiefly consists of pottery-ware. It is in Columbiana County, on the Ohio River, and near the eastern boundary of the state. It lies about equidistant from Wheeling to the south and from Pittsburg, Pa., to the east. It is served by the Cleveland and Pittsburg Railroad. There are over thirty potteries in the town, manufacturing various wares, such as terra-cotta, granite, stone and earthenware, besides glass-works, foundries and machine-shops. Population, 20,387.

East′on, a city of Pennsylvania, county-seat of Northampton County, situated at the meeting of the Lehigh and Delaware Rivers, is a wealthy manufacturing city, 67 miles from Philadelphia. The Delaware, Lehigh and Morris Canal terminates here, and with the rivers and railroads gives Easton a large trade. It also has foundries, rolling-mills, lock-factories, wire and rope-factories. It perhaps is best known as the seat of Lafayette College, whose Anglo-Saxon and Early-English department is one of the best in the country. It received its charter in 1826; and has six courses of study, 45 teachers and 519 students. Population, 28,523.

East Orange, N. J., a favorite residential town in Essex County, N. J., for the business men of New York, 12 miles distant. It is served by the Erie and Delaware and Lackawanna and Western railroads. It adjoins Newark to the south. It has, besides a great number of handsome suburban villas, some good schools and commodious churches. Its growth has been considerable in the past decade. Population, 34,371.

East Providence, a town in Providence County, R. I., directly opposite the city of Providence, on Seekonk River. The important industries of the town are linen-factories, bleacheries, chemical, electrical and wire-works. The town was incorporated in 1862. East Providence and Seekonk, Mass., once were a part of the town of Rehoboth. Population, 15,808.

East St. Louis, Ill., a city of St. Clair County, on the Mississippi River, opposite St. Louis. Mo. The cities are connected by a steel-bridge across the river. East St. Louis is a great railroad-center, and the emporium of a considerable trade. Here are a number of the largest stock-yards in the United States; it also has extensive car and machine-shops, foundries, rolling-mills, breweries, glass-factories, sugar-mills, steel-plants, etc. There are many good schools and churches, a public library, an academy and the Howe (Baptist) Literary Institute. In the past decade the population has doubled, being 58,547.

Eaton, Timothy, an eminent merchant of Toronto, Canada. Receiving his education and business training in the north of Ireland, he came to Canada in 1857, and after a brief experience in a country village established himself in Toronto. He was a man of integrity and great energy and personal force were potent factors in his success. He conducted his business on lines of absolute honesty and fairness to his customers, giving value in price and quality of goods, dealt on a cash basis, cut out middle-men and in all respects adopted modern methods. He thus not only built up for himself a business reaching from the Atlantic to the Pacific, but also wrought a revolution in the entire retail business of the country. Few men have accomplished as much for the commercial life of Canada as this young immigrant of 1857. The immense business he founded is now successfully continued at Toronto, Winnipeg and other places by his son, John C. Eaton.

Eau Claire, Wis., a city in western central Wisconsin, the capital of Eau Claire County, situated on the Chippewa River at the mouth of the Eau Claire. The two rivers divide the city into three sections. Three lines of railway give facilities to its trade, which is largely of lumber. Its industries embrace, besides iron and linen goods, furniture, shoes, paper-mills, machine-shops, foundries, flour-mills; but lumber is its chief export. It has a number of grain-elevators and saw-mills, sash, door and blind-factories, etc. The city is prominent as a summer resort, and has a public library, a high-school, a hospital, banks, newspapers and all the adjuncts of a modern city. Population, 18,310.

Ebers (*ā′bērs*), **Georg Moritz,** a distinguished novelist and student of ancient Egyptian life, was born at Berlin, March 1, 1837, and devoted himself to the study of Egyptology. He made a long journey to the east, and in 1870 was made professor of Egyptology at Leipsic. His most important and learned works are *Egypt and the Books of Moses* and *Through Goshen to Sinai.* He also wrote a number of historical novels, which have much value

GEORG M. EBERS

in regard to the life of early Egypt. The most famous of these is *Uarda*. Others are *An Egyptian Princess, Homo Sum, The Burgomaster's Wife* and *The Emperor*. He died on Aug. 7, 1898.

Eb′ony, a species of *Diospyros*, plants of the ebony family. The American representative is the common persimmon (*D. virginiana*). There are 180 species in the tropics and a very few in the temperate regions. Most of the species have valuable hardwood, but it is from certain of the tropical ones that the commerical ebony is obtained. *D. ebenum*, a tree becoming about 50 feet high and growing in the East Indies, is said to yield the best ebony.

Ebullition. See EVAPORATION.

Ecbatana (*ek-bat′a-nä*), the capital and chief fortress of Media, situated one and a half miles from Mount Orontes and at the foot of a hill crowned with the royal citadel and a magnificent temple of the sun. According to Herodotus, Ecbatana was founded about 700 B. C. and surrounded with seven walls, each higher than the one next outside it The inmost wall inclosed the citadel with the treasury. The city was taken by Cyrus in 550 B. C., and became the chief seat of his government. It was a favorite summer-residence of the Persian kings, and Alexander the Great stayed there for some months in 324 B. C. After his death it became a mere provincial town, but under the Parthians it again became a summer-home of kings. It again sank into insignificance till the Mohammedan period, when the modern city of Hamadan was built on the site of the ancient city. There were six other Asiatic cities to which the name Ecbatana was given by Greek writers.

Ecclesia (*ĕk-klē′zĭ-ȧ*), a popular assembly, especially of Athens, where the people had full sovereignty and at which every citizen of 20 years of age could vote. The Athenian ecclesia held originally four but finally 40 ordinary meetings in the year. The term was also given to the Jewish state, and so came to be used by New Testament writers to mean the church.

Echinodermata (*ē-kī′nō-dẽr′mȧ-tȧ*), the subkingdom of animals; containing starfish, sea-urchins, sea-cucumbers and crinoids. As the name implies, they all have a spiny skin. They are all inhabitants of salt water. The common starfish (see illustration) has five arms radiating from a central disk. At the end of each arm is a little red eyespot; on the back is a rounded tubercle through which water enters the body; on the lower surface, in the center of the disk, is the mouth; and along the middle of the arms, in grooves, are the tube-feet used in locomotion. Other varieties of starfishes are the brittle stars, the basket-fish, etc. The starfishes form one class of the subkingdom. The sea-urchins form another class. The common sea-urchins are rounded and have a hard, limy, outer case that is covered with numerous spines (see illustration). When the spines are removed, the case is seen to be made of limy plates nicely fitted together. Five sets of these plates, passing like meridians around the shell, are perforated by little holes for the tube-feet, and five other rows of plates are not punctured. Inside the shell is a very complicated structure containing five teeth, the points of the teeth coming to the surface at the mouth; the rest of the apparatus is within the shell. It is often called Aristotle's lantern. Other kinds of sea-urchins are flattened, and are variously called sand-cakes, sand-dollars, etc. Most of the starfishes and sea-urchins move by tube-feet, which are extended by water-pressure from within. A system of tubes, called collectively the water vascular system, carries water over the body. The tubes are arranged as follows: a central tubular ring about the mouth and five radiating tubes leading from it into the arms. From these main tubes smaller ones spring off, right and left, communicating with the tube-feet outside the body and with an equal number of rounded sacs within the body. The water enters through a sieve-like plate on the top of the body, and is carried by a tube to the central vessel around the mouth and then distributed through the rest of the system. The sea-cucumbers form another class. They have a long, plump body shaped like a cucumber, with tube-feet in rows along the body and a tree-like expanse at one end for breathing. The crinoids or feathered stars make another class. They have a body with branching processes extending from it, all borne on

STARFISH

SEA-URCHIN

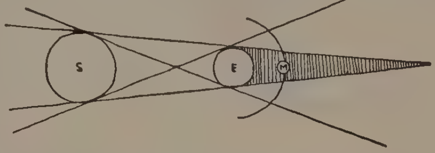
a stem which sometimes is very long. They are dredged from deep-sea waters in various parts of the world. The subkingdom *Echinodermata* is represented by many fossils in the rocks. The true position of the group among animals is not clear; but some of the larvæ of Echinoderms resemble those of worms, and this serves to relate them in a general way with the worms or to indicate that the remote ancestors of both groups were similar. See Romanes: *Jelly-fish, Starfish and Sea-Urchins.*

Echo, in Greek fable, a nymph employed by Zeus to keep the attention of his wife, Hera, by talking to her. Hera changed her from a nymph into a mere echo. She next fell in love with Narcissus, and pined away in grief for him, till nothing but her voice was left.

Echo, a phenomenon which is observed when a train of sound-waves strikes a large and fairly smooth body, such as a hillside or the side of a building. The phenomenon is identical in principle with that which occurs when water-waves strike a solid pier and are reflected, or with the reflection which occurs at a fret when waves travel along a guitar-string. Newton employed the echo in a cloister at Trinity College, Cambridge, to measure the speed of sound. Standing at one end of the cloister, he started a group of waves by stamping his foot. These waves were reflected at the far end of the cloister. The interval between the stamping of the foot and the hearing of the echo measures the time necessary for a sound-wave to make one round-trip of the cloister. From this interval and the length of the cloister the speed of sound is directly computed. The most interesting examples of echoes are, possibly, those which occur in the whispering-galleries, such as that in the dome of the Capital at Washington or in the dome of St. Paul's in London. For further details see Tyndall on *Sound.*

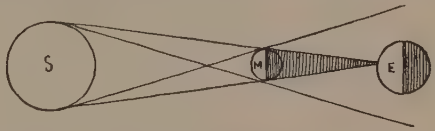
Eclipse, in astronomy, is used to describe the passage of one body through the shadow of another. When any portion of the earth's surface passes through the shadow of the moon, the phenomenon is called a solar eclipse. When the moon passes through the shadow of the earth, the phenomenon is called a lunar eclipse. When a satellite passes into the shadow of its planet, we have an eclipse of the satellite corresponding exactly to our lunar eclipse. When, however, the opaque planet or the opaque moon passes between us and the satellite, astronomers call this an occultation.

Conditions Necessary for a Solar Eclipse. The plane in which the moon revolves about the earth does not coincide with the plane in which the earth revolves about the sun; consequently there is not an eclipse of the sun once a month, but only when the moon passes through the plane of the earth's motion. Another condition also must be satisfied, viz., the moon must be "new," *i.e.*, must lie in the direction of the sun. Now it happens that these two conditions are met at intervals of about six months; so that we expect about two solar eclipses a year.



LUNAR ECLIPSE

The moon and the sun subtend nearly the same angle as seen by an observer at the surface of the earth, so that the moon ordinarily barely suffices to cover the face of the sun. When the moon is in that part of her orbit nearest the earth, her angular size is greater than that of the sun and the eclipse is said to be total; when, however, the moon is in that part of her orbit most distant from the earth, her angular size is diminished, so that the face of the sun is not quite covered. An eclipse of this kind is called an annular eclipse. As was well-known to the ancients, the circumstances of any solar eclipse are repeated almost exactly in a period of 6,585 days and 8 hours (approximately 18 years). The result is that any solar eclipse is repeated every 18 years. This is the period called the *saros.*



SOLAR ECLIPSE

Lunar eclipses are of very little interest from a scientific point of view: but the phenomenon is so striking as always to command popular attention. In the case of the solar eclipse, however, we have our only opportunity to study the solar corona, a magnificent appendage of the sun having a diameter not less than 2,000,000 of miles. Previous to 1869 solar eclipses furnished our only opportunity to study the prominences, great outbursts of incandescent vapors which occur constantly on the surface of the sun. Every total solar eclipse is an event of interest and importance to scientists. Long journeys for purposes of observation are made by expeditions sent out by scientific bodies. Thus valuable data, including photographic records of every phase of the phenomena are secured. For details concerning eclipses see the *American Ephemeris* for two or three years proceding the eclipse. For an excellent account of the entire subject see Young's *General Astronomy.*

Eclip'tic, in astronomy, the term applied to the apparent path of the sun in the heavens in the course of a year. It is the circle in the celestial sphere to which longitudes and latitudes are referred, and the circle in whose plane eclipses occur, since an eclipse cannot take place unless the moon be in or near the ecliptic. The circle of the sphere is inclined to the equinoctial at an angle of 23° 27′ 5″, and cuts it in two opposite points named the equinoxes. The angle of the inclination of the equator and ecliptic is a variable quantity, and is called the obliquity of the ecliptic. The result of this angle is the change of the seasons.

Ecology (*ė-kŏl'ȯ-jy̆*), often spelled œcology. In botany it is that division of the subject which deals with plants in relation to their environment. This environment includes both the physical conditions in which plants live and other plants and animals. There are two prominent phases of ecology. One considers the individual plant as it relates its organs to the environment. For example, the relation of leaves to light, of roots to the soil, of flowers to insects; the protection of various organs or the whole plant against drouth, cold, intense light, poor nutrition; the arrangements for the dispersal of spores and seeds; and many other subjects all belong to this phase of ecology. The other phase of the subject deals with plants associated together in what are called plant-societies. Plants are not scattered at haphazard over the surface of the earth, but are organized into definite societies or communities, as a forest-society, a meadow-society, a swamp-society, etc. These societies are determined by varying combinations of numerous factors, such as temperature, water, soil, light, wind, and they are as numerous as the possible combinations of these factors. This study of plant-societies merges into the study of the natural floras of the world, which are combinations of societies; and this in turn leads to the study of geographical botany. The study of the conditions which determine floras is often called floristics; while the combination of plant-societies, floristics and geographical botany is sometimes called phytogeography.

John M. Coulter.

Ecuador (*ek'wä-dōr'*), a republic of South America, lying on the equator and bounded on the west by the Pacific, is thrust like a wedge between Colombia and Peru. It has a seaboard of 400 miles, but its other boundaries are not definitely settled. Its area is about 116,000 square miles, much of it being rich in mineral ores, including gold and silver. The Galapagos Islands also belong to it.

Surface and Drainage. Ecuador consists of three general divisions: the lowlands west of the Andes, the mountainous plateau of the interior and the elevated forest-country to the east. Very little is definitely known about the physical features of the country. The principal mountains either are or have been volcanoes. Many large rivers water it, the most important of which are the large branches of the Amazon.

Climate. The climate is warm but not wholly tropical, altitude neutralizing latitude and the snowline averaging 15,500 feet above tidewater. Cultivation reaches high altitudes, and the plain of Quito, nearly two miles above sealevel, is clothed in luxuriant vegetation. The intermountain regions have a temperate climate resembling perpetual spring. Constant heat and excessive moisture render eastern Ecuador essentially tropical. On the coast the rainy season usually lasts from December to May, but on the Amazon branches it rains nearly all the year round.

Agriculture and Animals. Ecuador is an agricultural country. In the southern regions, adjoining Peru and the Amazon valley, sugar-cane and oranges are cultivated, while in the northern regions, adjoining Colombia, are found wheat, barley, clover and beans. Wild animals of many kinds abound, and the country is the paradise of birds and insects.

Inhabitants and Religion. The whites, who are the landholders and merchants of the country, are hospitable and generally intelligent, but are apt to be lazy. The half-breeds are true savages, while the Christianized Indians are peaceable and contented, though many have sold themselves into slavery. Uncivilized tribes inhabit the country east of the Andes. The state religion is Roman Catholicism. There are many convents, monasteries and seminaries. Education is compulsory, but has not advanced far.

Manufactures and Railroads. Manufactures are limited to timber, coarse cloth, cassava-flour, kerosene and the preparation of spirits from sugar-cane and of flour from the yuca or cassava root. Guayaquil is famous for its hammocks and panama hats. Communication is effected by packmules on bridle paths, coastal steamers, a railroad from Guayaquil to Quito (268 miles) and 125 miles of wagon-road. The chief towns are connected by telegraph, and telephones are used in Quito and in several of the provinces. The exports are mainly coffee, cocoa, vegetable ivory and hides.

Government and Cities. The republic has passed through a series of violent revolutions since its establishment as an independent state in 1831. Under the last constitution there now are a president for four years, a vice-president, a cabinet of four ministers and a cabinet of state, besides a senate and house of representatives. The state is divided into three military districts, containing 17 provinces under governors.

Quito, the capital (80,000), has a university and an institute of sciences, and there are universities in Azuay and Guayas. The principal cities are Quito, Guayaquil and Cuenca. The population is 1,400,000. See *Travels in the Wilds of Ecuador*, by Simson, and *Four Years among Spanish-Americans*, by Hassaurek.

Edda (meaning *great-grandmother*), the name of two very different collections of old Scandinavian literature. The Younger or prose Edda was written between 1050 and 1133, and discovered in 1628. The Elder Edda is a collection of songs, mostly Icelandic. These are 39 poems which sing the praises of old Scandinavian gods and heroes. They belong probably to the 8th and 9th centuries. See *Iceland, Its Scenes and Sagas*, by Baring-Gould.

Eddy, Mary Baker, founder of the system known as Christian Science, was born at Bow, New Hampshire. She was educated in the public schools and by private instructors. In 1867 she announced and began to teach her system. She organized the Church of Christ, Scientist, in Boston in 1879, was ordained to the ministry and founded the Massachusetts Metaphysical College in Boston, which was chartered in 1881. In 1883 she founded the *Christian Science Journal*. She is the author of *Science and Health with Key to the Scriptures* and many other works on the subject. The sect which she founded spread rapidly, and is now represented by churches in many cities She died Dec. 3, 1910.

Ed'dystone Lighthouse was first built in 1696–1700 on the group of rocks called the Eddystone, lying between Start Point and the Lizard in the English Channel, nine miles from the Cornish coast. The rocks are covered every day by the tide, and were the cause of many shipwrecks before the lighthouse was built. The first lighthouse was completely washed away in a storm in 1703, and the second was burned in 1755. The third was built of limestone incased in granite. The granite is dovetailed into the solid rock, and each block into its neighbor. It was shaped like an oak-tree and the light could be seen for 13 miles. The lighthouse was of great strength, but the sea began to wash away the foundation-rocks, and it thus became necessary to build another. The new one was put up in 1882, and is like the one before it, with the exception that it is higher and is equipped with newer apparatus. It casts a light for 17½ miles. See LIGHTHOUSE.

E'den, the name of the district situated in paradise. It lay in the east in the highlands of Central Asia. Many efforts have been made to discover just where Eden was, but scholars do not at all agree as to its precise location. The Aryan races, as well as the Hebrews, believed that the human race had its origin in the mountains of Central Asia.

Edge'hill, a hill or ridge in Warwickshire upon which was fought the first important battle of the Civil War in England, Oct. 23, 1642. King Charles intended to march upon London, but was met by the Earl of Essex with 10,000 of the troops of the Roundheads. The king's army was in number about 12,000, and was drawn up on Edgehill. Prince Rupert, who led the right wing of the royalists, charged with his cavalry the left wing of the Roundheads and pursued it for several miles; but meanwhile the right wing of the Roundheads drove back the royal infantry with great loss. The battle was indecisive, the royalist loss being the heavier.

Edgeworth, Maria, English novelist, was born in Oxfordshire, Jan. 1, 1767, and died near Longford, Ireland, May 22, 1849. She began to write fiction early in the 19th century, though she had previously taken an interest, with her father, in educational topics. Her chief stories, which treat mainly of the virtues and vices of humanity and have high moral aim, embrace *Popular Tales, Moral Tales, Castle Rackrent, Belinda Ormond, Tales of Fashionable Life* and an *Essay on Irish Bulls.*

Edict of Nantes. See HUGUENOTS.

Ed'inburgh, the capital of Scotland. It stands about two miles from the sea on a series of ridges, and is overlooked by Arthur's Seat and other hills. Arthur's Seat is a picturesque hill in Queen's Park, near the city, and its name is supposed to go back to King Arthur's time. It rises 822 feet above sealevel, and gives a view of great extent and wonderful beauty. Of the hills within the city the most important is Castle Rock. In the beginning of the 7th century Edinburgh is mentioned as the capital of the kingdom of Northumbria, and named after its king, Edwin. The city was made a borough by Robert Bruce, who also gave it the right to establish a port at Leith, two miles away. During the 15th century it began to be recognized as the capital of Scotland, and Parliament regularly met there. In 1544 the city was burned by the English. In 1561 Queen Mary came back from France, and the tragedy of her short reign was acted almost entirely in Edinburgh. It was at Holyrood Palace that Rizzio was killed; in Kirk-of-Field, near where the university now stands, Darnley was murdered; and in the chapel of Holyrood Mary was married to Bothwell. The union of England and Scotland, in 1707, drew away the Scottish nobility from Edinburgh, but the Pretender was welcomed there for a short time in 1745. Since then the city has spread far beyond its ancient walls, and has become famous as a center of scientific and literary activity. Its many fine buildings and picturesque situation extending up the hills which lie outside the old town, make Edinburgh one of the most beautiful cities of Europe. It is still representative of the capital of Scotland. It is the seat of the law-courts and of some of the departments of government. It is the center of much of the intellectual life of the northern kingdom, and it has long been known for its educational institutions. It is not a manufacturing town to any great extent, its most important industries being brewing and publishing. It returns four members to Parliament. Population, 320,239. See *Old Edinburgh*, by Drummond, and *Old and New Edinburgh*, by Grant.

Edinburgh University took its origin from the zeal of the Reformers for education. In 1583 the college was opened. In the 18th century it began to grow. The beginning of a medical college was made in 1724, and in the latter part of the century the fame of the university was greatly increased by the reputation of several of its professors, and since then it has become one of the greatest universities in Great Britain. A students' representative council was founded in 1884, as a means of expressing the opinion of the students on university matters. Goldsmith, Scott, Carlyle and Darwin are among the eminent students of the university, and many learned men have been professors there. There are four departments, that of arts, of divinity, of law and of medicine. The university-library contains 150,000 volumes, and there are several smaller libraries besides. It has 133 professors and 3,200 students. The university also has a natural-history museum, an anatomical museum and a botanical museum. There are a large number of scholarships and fellowships.

THOMAS ALVA EDISON

Edison, Thomas Alva. To no other man who ever lived does the term "born inventor" apply so aptly as to the "Wizard of Menlo Park." Watt and Morse achieved invention by years of patient scientific investigation; Arkwright and Whitney had invention thrust upon them by circumstances; Fulton was an inventor by natural gift, but followed the profession of an artist up to the age of 40. But Edison lived and breathed in the atmosphere of creation from early boyhood, jeopardized his scant living for the pure joy of doing his own work, and was known as the boy-wonder in electricity on Wall Street, New York, soon after he cast his first ballot. It has been said of him that he "kept the path to the patent-office hot with his foot-steps."

The thing that impresses the reader of a life of Edison, first and last, is its joyousness. From babyhood he was the busiest, happiest, most intensely interested in life of any boy in the village of Milan, Ohio, where he was born on February 11, 1847. His father made shingles by hand, and Alva, as he was then called, haunted the shop. But he found the docks along the canal more dramatic, for sometimes as many as five hundred wagon-loads of wheat and corn would be brought in by farmers in one day and loaded on the grain-boats. He watched everything with his big gray eyes, and was not slow about asking questions. A sturdy little "sobersides," his mother called him, too busy to play much with other boys. At home he was a voracious reader, and when the family moved to Port Huron, Michigan, he set himself seriously to work to reading all the books in the public library, a task he wisely abandoned. At 12 he became a business man, and had marked success as a train boy. He sold more newspapers, books and fruit than the other boys, and still had time to print a little newspaper and start a laboratory in one end of the smoking-car. In saving the life of a station-agent's baby he won a friend who taught him the trade of telegraph-operator. He soon became skilful in sending and taking messages, but he had to know how the instrument worked and why, and experimented with an old battery in his father's cellar until he understood it.

At 15 Edison was in charge of the station at Stratford, Canada, where he was so busy doing his own work that he very nearly caused a wreck on the road and won his discharge. It must be said that he never worked well under orders. He lost positions by his inattention to duty almost as fast as he gained them by ability. His first invention was of a repeater, that would take down the dots and dashes as they came rushing over the wire, and repeat them as slowly as necessary for the operator to write out at his leisure. Then he began to experiment on the problem of sending more than one message at a time over the same wire. He dressed shabbily, and spent all he earned on books and apparatus. He was thought to be an impractical, dreamy fellow, and his employers were often impatient. Thus for five years he led a wandering life, often out of work that would bring in money, but working hard on his own ideas and leading a clean, straight life of the intellect. Pleasures never tempted him. His idea of fun was to be so absorbed that he didn't know if it were night or day. "I owe my success," he has often said, "to the fact that I never had a clock in my workroom."

At 21 Edison went to Boston, a rapid operator. In another year he was in New York, when accident led him to repairing a ticker in a broker's office and to a salary of $300 a month. Then he invented an improved apparatus for which he got $40,000. The Western Union took an option on his future inventions, and the young genius started a factory in Newark, New Jersey, with 300 employes. It was the most remarkable establishment in the world, where everybody worked from sheer enthusiasm, with irregular hours and no book-keeper. But Edison literally coined his inventive brain into money. He had 50 inventions at various stages at one time, wired instructions to his patent-attorney every day, and cabled applications for patents to London. Before he was 30 the factory was sold, and Edison built the laboratory at Menlo Park to devote his time entirely to invention. There he worked out the problems of the telephone, the incandescent electric light, the phonograph and other great discoveries

Ah, what a workshop that was! One hundred feet long it was, with a maze of wheels and flying belts, lathes, drills, planers and milling-machines.

HIS METHOD OF WORKING.

Above were a chemical laboratory and a library; and skilled workmen and scholarly experimenters, a private secretary and even a book-keeper. A big workshop and a small house suited Edison exactly. He went about in shabby work-clothes and acid-stained hands. Most of the time his wife and children dined alone, for the Wizard was never to be disturbed. He ate when he was hungry and rested when he was tired and had as much fun in his work as a boy at a ball game.

Not all of his inventions were made easily. Some he worked on for years and spent thousands of dollars in perfecting. One rule he has always kept: "Be sure a thing is needed or wanted, then go ahead." The phonograph, telephone transmitter, electric light and power system, megaphone, quadruplex, tasimeter for measuring the heat of the stars, kinetoscope, anyone of a dozen big inventions would have won fame for the man, but they are not usually identified as belonging to him in the multitude that bear his name. The electric light made him rich, but cost him years and vast expense to perfect. Men were sent around the world to find material for the filament.

THE FIRST ELECTRIC LIGHT.

It was in 1880 that Menlo Park was first illuminated with the electric light. Special trains were run out for the event from New York City, and there was as much excitement as when the first steamboat was launched on the Hudson. In 1886 Menlo Park was outgrown, and an immense plant built at Orange, New Jersey. Wealth and fame, however, have not brought leisure to the inventor. His highest pleasure is his work, and he gives the world his best in his inventions, he says: So why should he give his society? But the world insists that the best of any man always is himself, and is disappointed that Edison continues to seclude himself in his shop. The few who are privileged to know him testify to his personal charm. He is philosophical, enthusiastic, cheerful; loves a good story or a joke; enjoys music and books and children, and takes occasional trips abroad with his family. He apparently knows as little what time of life it is with him, as what time of day. Life has not lost its zest nor work its charm.

Edmonton, the capital of Alberta, population 16,000, on the Saskatchewan River, is 180 miles north of Calgary. Valuable coal-fields surround it. The trade of the great Mackenzie basin is attracted to it. It is the center of an immense and rich agricultural tract, and was an important point in connection with the fur-trade. In early days it was a point of departure on the Edmonton route for the Klondike. A railway-center, served alike by the Canadian Northern, the Canadian Pacific and the Grand Trunk Pacific, Edmonton is growing rapidly and promises to be a considerable city.

Ed'mund, for his bravery surnamed Ironside, king of England for seven months in 1016, was son of Ethelred the Unready and half-brother of Edward the Confessor. He is said to have been born in 989. He was chosen king by the Londoners, while Canute was chosen by the *witan* or council. Edmund entered the struggle with great energy. He gathered an army and defeated Canute in two hard-fought battles. He then raised the siege of London, and again was defeated in Essex, and this forced him to agree with Canute to a division of the kingdom, Canute taking the north side, while Edmund took the south. It also was agreed that, in case one of the kings should die, the other should become king of the whole of England. A few weeks after this agreement Edmund was murdered in 1016.

Edmunds, George Franklin, an American statesman, was born at Richmond, Vermont, Feb. 1, 1828. He was admitted to the bar in 1849, and sat in the state legislature from 1854 to 1859 and in the state senate from 1861 to 1862. In 1866 he was elected to the senate of the United States, where he served on many important committees, and was president *pro tempore*

GEORGE F. EDMUNDS.

after Mr. Arthur became president. He took an active part in the prosecution of President Johnson, and was one of the electoral commissioners appointed in 1877 to decide upon questions connected with the counting of the electoral vote of the disputed presidential election of the previous year. He was the author of the acts of 1882 and 1887 for the suppression of polygamy in Utah. In 1891 he withdrew from political life. He is noted for legal knowledge and great parliamentary skill.

E'dom or **Idumea,** a name given to the whole country extending from the Dead Sea southward to the Gulf of Akabah. It was about 100 miles long from north to south. The mountains are steep, bare masses of chalk and porphyry. The Edomites were recognized by the Israelites as a closely connected race, being the descendants of Esau, the brother of Jacob. Their religion was a belief in many gods. They were conquered by Saul and subdued by David, and were subject to Judah until the reign of Joram. They regained independence under Ahaz, and after the fall of Judah became masters of southern Palestine and Hebron, but were completely subdued about 126 B C. From that time the western part (Idumea) was held by Jewish governors, one of whom, Antipater, became procurator of all Judæa in 47 B. C. His son, Herod the Great, founded the last Jewish dynasty. After the destruction of Jerusalem (70 A. D.) the country was merged in Arabia Petræa, and the name of Idumea disappears from history. See *The Desert of the Exodus* by Palmer.

Education, History of. A liberal professional preparation for teaching is hardly possible without a comparative study of educational progress as shown in past and present educational systems. It may take either of two general forms: that of education as a whole or that of formal pedagogy in particular. If the former, the field includes a history of the growth of all branches of learning and of the various institutions of civilization in general; if the latter, it is limited to the development of educational doctrine and the growth of systems and methods. There are commonly recognized five great epochs in educational history: the Oriental, the Classical, Christian before the Reformation, the Reformation and the Modern Epoch. Each epoch is rich in instructive material, throwing light upon nearly every problem which the teacher meets and helping him to a more comprehensive view of the methods by which they may be solved.

The following are among the most commonly used texts on this subject: Compayre, Painter, Seeley and Williams. See also Boone's *Education in the United States*, Swett's *American Public Schools*, Klem's *European Schools*, Quick's *Educational Reformers*, Laurie's *Rise and Early Constitution of Universities*, Lang's *Great Teachers of Four Centuries* and the histories of education in the different states of the Union, published by the bureau of education. Among these texts one of the oldest and perhaps the most interesting is Quick's *Educational Reformers.* A more recent and comprehensive work is Paul Monroe's *History of Education.* This is a volume of nearly 800 pages, and is an extremely valuable work. The substance of this is now available, also, in a volume of a little over half the size, suitable for beginning students. The title is *A Brief Course in the History of Education*

Education, Modern. Perhaps no phase of social activity has undergone so radical a development in modern times as that of education. This evolution may be outlined under the headings of aim, subject-matter, method and organization of education. In regard to aim, four points may be noted. First: The ideal has come to be more and more progressive. Education no longer regards itself as confined to the task of fitting the child to live contentedly the life of the parent, but consciously labors to inspire the young to strive for better conditions and to prepare them to attain these. Second: Education no longer, as in ancient times, aims to train the individual merely in the interest of society nor, as in medieval and comparatively modern times, for individual culture or development, but rather for what may be called social efficiency. Third: Such an aim includes not only the religious, ethical and cultural training toward which attention was formerly almost solely directed in the education of the school, but vocational training, whether along professional or industrial lines, and such political training as fits for citizenship in those advanced nations where self-government prevails. Fourth: All this involves the extension of education to all classes, so that no general phase of culture is peculiar to any social order.

The subject of education has been affected by all of these modifications in aim. Science, history and modern literature have been added to mathematics, theology and the classics. In general the curriculum has been enriched by subjects giving interesting or valuable subject-matter, and the disciplinary subjects have been reduced in importance. The elementary school has developed geography, nature study, literature, manual training and art in addition to the three "Rs." The subject-matter of the various vocations, from engineering to medicine, has been organized and taught.

In method the most important reform is due to the growth of the now well-established belief that mastery of method is quite as important to the teacher as knowledge of subject-matter. Psychology has been appealed to as a source from which correct method should be derived. In general, mechanical memory-work has been replaced by such as appeals to reason and stirs interest and spontaneity. The inductive method, involving the idea of development lessons (see METHOD OF TEACHING), library-methods, laboratories, workshops, illustrations, all rouse self-activity (q.v.), excite interest (q.v.), involve the constant application of what is learned, and aid in producing a progressive, alert and adaptable rather than a mechanical and passive character. The idea of formal mental discipline (q.v.) has been discredited by psychology, and more and more abandoned for that of discipline through valuable and interesting subject-matter. The course of study has been organized to appeal more to the powers, instincts and interests of the child at various stages in his development. Finally, trained psychologists have been to some extent employed in connection with school-systems.

In organization the most marked advances of modern times have been the development of state-systems of popular education (practically the creation of the 19th century), the transfer to a large extent of education from church or private control to that of the state, the expenditure of enormously greater funds for educational purposes, the development of supervision, very close in the advanced states of Europe, professional training for teachers, the differentiation of schools according to the aim of the instruction, and the better organization and unification of national systems. In all these directions an enormous amount remains to be done.

See APPERCEPTION, CORRELATION, CHILD STUDY, INTEREST, METHOD IN TEACHING, MENTAL DISCIPLINE, PSYCHOLOGY FOR TEACHERS, SELF-ACTIVITY and SCHOOLS, ELEMENTARY. Consult *Text-Book in the History of Education*, Monroe.

Education, State-Aid in. In the United States, education is one of the matters which falls within the control of the several states, and not of the Federal government. The result of the power lodged in the states is that they tend to give aid in money and land to the schools; while, in return, their control over the schools increases, and the educational system in this way becomes more uniform. Thirty of the states make the education of children compulsory for an average term of five years. Most cities have their own superintendents of public instruction, and their own school-systems under a charter from the state. Each state, however, has a superintendent of public instruction who is given this title in 29 of the states, other titles in others. One of the benefits of state-control in education is that the more prosperous sections help to improve the schools of less prosperous places. The state generally supports normal schools for the training of teachers. In the west and south the states go so far as to support universities, which is done nowhere else in the world to anything like the same extent. Secondary education often receives special attention from the state. Massachusetts requires the townships to maintain secondary schools. The University of the State of New York, however, is the best example of how the state may organize secondary education. The regents examine the high-schools, and allot vast sums in their aid. In Indiana, Minnesota and other western states the state-board of education accredits high-schools, which may then send their graduates direct to the state-university without examination. Each state admitted to the Union since 1800 has ceded land for a state-university and for common-schools. In 1836 many of the states distributed the surplus revenue that was returned to them by Congress wholly or partly among the schools. Of the land-grants for education made by the states, the chief is the 16th section of each township and, in states admitted since 1848, the 36th section also. In all, the states have granted about 68,000,000 acres of land; and to this they have added vast grants also in money.

Ed'ward, surnamed the Confessor, the last Anglo-Saxon king of the old royal line, was the elder son of Ethelred the Unready. On the deaths of Ethelred and Edmund Ironside, in 1016, Canute obtained possession of the throne and married the wife of Ethelred. Until Canute's death, in 1035, Edward lived in Normandy, but in 1042 he succeeded his half-brother, Hardicanute, as king. He was continually under the influence of favorites, who usually were foreigners; and the history of his reign is a record of the struggle between the Norman or court party and the old Anglo-Saxon party under Earl Godwin and his son Harold. Edward also carried on wars with the Welsh. He died on Jan. 5, 1066. He was canonized in 1161 by Pope Alexander III. With him the old English monarchy perished, save for the few months of the energetic rule of his successor, Harold II.

Edward I, king of England, the elder of the two sons of Henry III, was born at Westminster, June 17, 1239. At the parliament of Oxford (1258) he took part with his father in his contest with the nobles, but later seems to have sided with Earl Simon de Montfort, the leader of the barons or national party, but soon joined his father again. It was his rash eagerness which lost the battle of Lewes (1264), in consequence of which he was imprisoned as a hostage for his father's pledges. He made his escape soon after and gained the battle of Evesham (1265), which ended the great struggle between the king and the barons by the death of Earl Simon on the field. In 1270 Edward set out on a crusade, and two years later barely saved himself by his great strength from being murdered by one of the infamous sect of the Assassins. While he was still absent, his father died, and Edward was proclaimed king, but did not reach England till nearly two years after. He at once began that policy of reform which has given him the name of the English Justinian, and made his reign almost the most important period in the constitutional history of England. His first war was with the Welsh, and ended in the complete subduing of that nation at the defeat and death of Prince Llewellyn and the execution of Prince David as a traitor in 1283. In 1290 he banished all the Jews from the kingdom, to the number of over 16,000, on the charge of excessive usury. About the same time the contest for the Scottish crown gave Edward a chance to assert the old claim of the English crown to the over-lordship of Scotland. He decided the contest in favor of John Balliol, who swore homage to him for the whole of Scotland. Meanwhile a war with France was threatening, and Edward called together an assembly which was practically the beginning of the modern English parliament. Balliol soon found his position as a vassal-king intolerable, and open war broke out in 1296. Edward marched north, forced Balliol to surrender, and subdued the kingdom in five months. Then he sailed to Flanders to carry on the French war; but, in order to make peace with his nobles at home, he confirmed the Great Charter and added other clauses, thus finally establishing the right of the people themselves to determine their own taxation. As a landmark in the history of England, this is second only to *Magna Charta* itself. Affairs in Scotland soon compelled his return from Flanders. Wallace had collected a large force, and completely defeated an English army at Stirling (1297). Edward, however, defeated Wallace at Falkirk, and afterwards (1305) executed him as a traitor. He then prepared a new constitution for the conquered kingdom, and made arrangements for the representation of the Scots in the English parliament, a measure which, had it been successful, would have joined England and Scotland together four centuries before the union took place. But, before long, Robert Bruce raised a revolt, murdered the regent, Comyn, and was crowned king (1306). Edward at once set out against him, but died on the way, in July, 1307, at Burgh-on-Sands, near Carlisle, leaving his son Edward the command not to bury his body till he had utterly conquered the Scots. The people loved him dearly. See *The Early Plantagenets*, by Stubbs, in *Epochs of Modern History*.

Edward II, son of the preceding, was born in Wales, April 25, 1284, and created Prince of Wales in 1301, being the first heir to the English throne who bore that title. He accompanied his father on his last expedition to Scotland, but, instead of carrying out his dying command, he returned to London and gave himself up to pleasure. He came to the throne in 1307, but always was under the influence of favorites. The first of these was a Gascon, Piers de Gaveston, whom he left as guardian of the kingdom while he went to France to marry Isabella, the daughter of Philip V. The nobles demanded the banishment of Gaveston, and twice he was forced to leave the kingdom, being finally executed by the nobles in 1312. Two years later Edward invaded Scotland at the head of 100,000 men, but suffered a terrible defeat by Robert Bruce at Bannockburn, which secured the independence of Scotland. In 1321, with the aid of his new favorite, Hugh le Despenser, and his son, Edward overthrew and put to death his minister, Lancaster, who had controlled him for some years. He then sent Isabella, his wife, to France to treat with her brother, the French king, about a quarrel which had arisen between the two countries. Isabella despised her husband and hated the Despensers, and so joined several of the discontented nobles in a conspiracy against Edward. She landed in Suffolk with a force in September, 1326, captured the king and cast him into prison. The Despensers were executed, and Edward was compelled to resign the crown. He was murdered at Berkeley Castle a few months later, in 1327.

Edward III, son of the preceding, was born at Windsor in 1312, and was crowned king, Jan. 29, 1327. During his childhood the country was governed nominally by a council of nobles, but really by Roger Mortimer and Queen Isabella. In 1330 Edward seized Mortimer and put him to death, and sent away his unworthy mother. He then invaded Scotland to help Edward Balliol, son of John Balliol, who had secured the crown. He defeated the Scots at Halidon Hill (1333), and made Balliol do homage to him. As a warrior, Edward's greatest exploits were in France. He laid claim to the French throne and made war on Philip VI. This was the beginning of the Hundred Years' War. His claim, through his mother, a sister of Charles IV, was groundless; but, nevertheless, he carried on the contest with great vigor. He laid heavy taxes on the people in order to raise money for the war, and was obliged to grant many valuable privileges, especially to the nobles. Accompanied by his eldest son, called the Black Prince, he conquered a great part of Normandy and gave the French a terrible defeat at the famous battle of Crécy (1346), where the Black Prince, though but 16, showed the greatest courage. The city of Calais was taken after a siege of 12 months, and the six burgesses who offered themselves to the king, as a sacrifice for the safety of the rest of the citizens, were saved from the king's wrath only by the entreaty of the good Queen Philippa. Meanwhile the Scots had been severely defeated at Neville's Cross (1346) and their king, David II, taken prisoner; while in 1349 the Black Death had carried off a third of the population of England and permanently changed the relations between master and laborer. After a long truce the French war began again in 1355, and next year the Black Prince won the victory of Poictiers, where the French king, John, was captured. The Black Prince was given Aquitaine and Gascony by his father, and before long got himself and King Edward into another war with France, which was disastrous to England. In spite of all his brilliant victories and the bravery of his son, Edward was unsuccessful in his wars. Affairs at home were in a bad condition; he quarreled with his parliaments, gave himself up to the influence of his mistress, and let his government slip into the hands of his third son, John of Gaunt. The Black Prince, who had headed a party opposed to his father, died in 1376, and the following year the king himself died, after a reign of over 50 years. See *Edward III*, by Warburton, in *Epochs of Modern History*.

Edward IV, son of Richard, duke of York, was born at Rouen in 1441. It was the period of the struggles between the two great houses of York and Lancaster. Upon the death of his father at the battle of Wakefield in 1460, Edward found himself at the head of the Yorkist party. He soon gained the battle of Mortimer's Cross, and, though the Earl of Warwick a few days later lost him the second battle of St. Albans, he entered London in triumph and was hailed as king. Soon after, he gained the great battle of Towton, which seated him on the throne (1461). Margaret, the queen of Henry VI, kept up the struggle in the north, but the capture of the weak and unhappy Henry VI put an end to her hopes. Edward quickly became popular because of his frank manners and handsome figure; but his marriage with Elizabeth Grey, daughter of the Lancastrian, Lord Rivers, and the raising of her relations to power displeased the Earl of Warwick, who was the king's most powerful minister. Warwick entered ino a conspiracy against him and tried to bring back the Lancaster party to power, but was defeated and killed in the battle at Barnet in 1471; and the war was ended by the defeat of Queen Margaret at the battle of Tewkesbury. Edward showed the cruelty of his nature by the murder of Margaret's young son after the battle and the severity of his vengeance on other captives. (The murder is now credited to Richard, afterward Richard III). The death, in the Tower of London, of the old king, Henry VI, made Edward feel secure on the throne. He practically stopped the calling of parliaments, and got the money he needed by taking forced loans from wealthy men and by carrying on trade by means of his merchant-vessels. He died in 1483, worn out by his evil life. See *Houses of Lancaster and York*, by Dr. James Gairdner, in *Epochs of Modern History*, and Green's *History of the English People*.

Edward V, son of the preceding, was born in 1470. At the death of his father he was a boy of 13. His uncle, Richard of Gloucester, managed to get himself appointed protector of the kingdom, and shut up the young Edward and his little brother in the Tower. They were never heard of again, but there is much doubt that they were murdered by the order of their uncle, who had himself crowned king in the same year. (Later historians charge Henry VII with these murders). Nearly 200 years later some bones were found in an old chest and, being supposed to be the remains of the unfortunate princes, were buried in Westminster Abbey.

Edward VI, born on Oct. 12, 1537, was the son of Henry VIII, by his third queen, Jane Seymour. He was taught by such learned men as Roger Ascham, and in January, 1547, he succeeded his father as king, his uncle, afterward Duke of Somerset, having been made protector. Somerset invaded Scotland to try to compel the marriage of Edward and Mary, Queen of Scots. He gained the battle of Pinkie, but had to return home because of the intrigues of his brother, Earl Seymour, whom he executed. Two rebellions, one of the Catholics and the other of discontented laborers, were put down; but by the intrigues of Dudley, Earl of Warwick, Somerset was accused of treason and beheaded. Dudley (now become Duke of Northumberland) then married his son to Lady Jane Grey and induced Edward, who was dying, to make her his successor on the throne. The king lived only a short time after, dying in July, 1553, as some thought, of poison. Under Edward the Catholics were greatly persecuted by the Protestant leaders. See *Literary Remains of Edward VI*, by J. G. Nichols.

Edward VII, king of Great Britain and Ireland and Emperor of India (long known as Albert Edward, Prince of Wales), was born on Nov. 9, 1841, at Buckingham Palace, London, the eldest son of the late Queen Victoria, whom he succeeded on the throne, Jan. 22, 1901. In 1863 he married Princess Alexandra of Denmark, eldest daughter of King Christian IX, and before his accession he was continually before the British public as the most active member of the English royal family, figuring at innumerable court and civic functions at home and abroad, besides visiting foreign countries and in numberless ways doing unwearied work in his high station for the crown and the nation. Among all ranks of the British people Edward VII was a favorite, and after his accession to the throne his course was marked by tact and judgment as well as by conscientious principle, as king and ruler. King Edward was uncle to Emperor William of Germany and to the present Emperor of Russia and also brother-in-law of the King of Greece. He was crowned on Aug. 9, 1902. His living children are George, who was Prince of Wales and is now King George V, who in 1893 married Victoria Mary, daughter of the Duke of Teck; Louise, Princess Royal, who in 1899 married the Duke of Fife; Princess Victoria Alexandra; and Princess Maude Charlotte, who in 1896 married Prince Karl of Denmark, now King Haakon VII of Norway. His only living brother is Prince Arthur, Duke of Connaught; while his sisters are Princess Helena, Princess Louise and Princess Beatrice. He died May 6, 1910.

EDWARD VII

Edward the Black Prince. See EDWARD III.

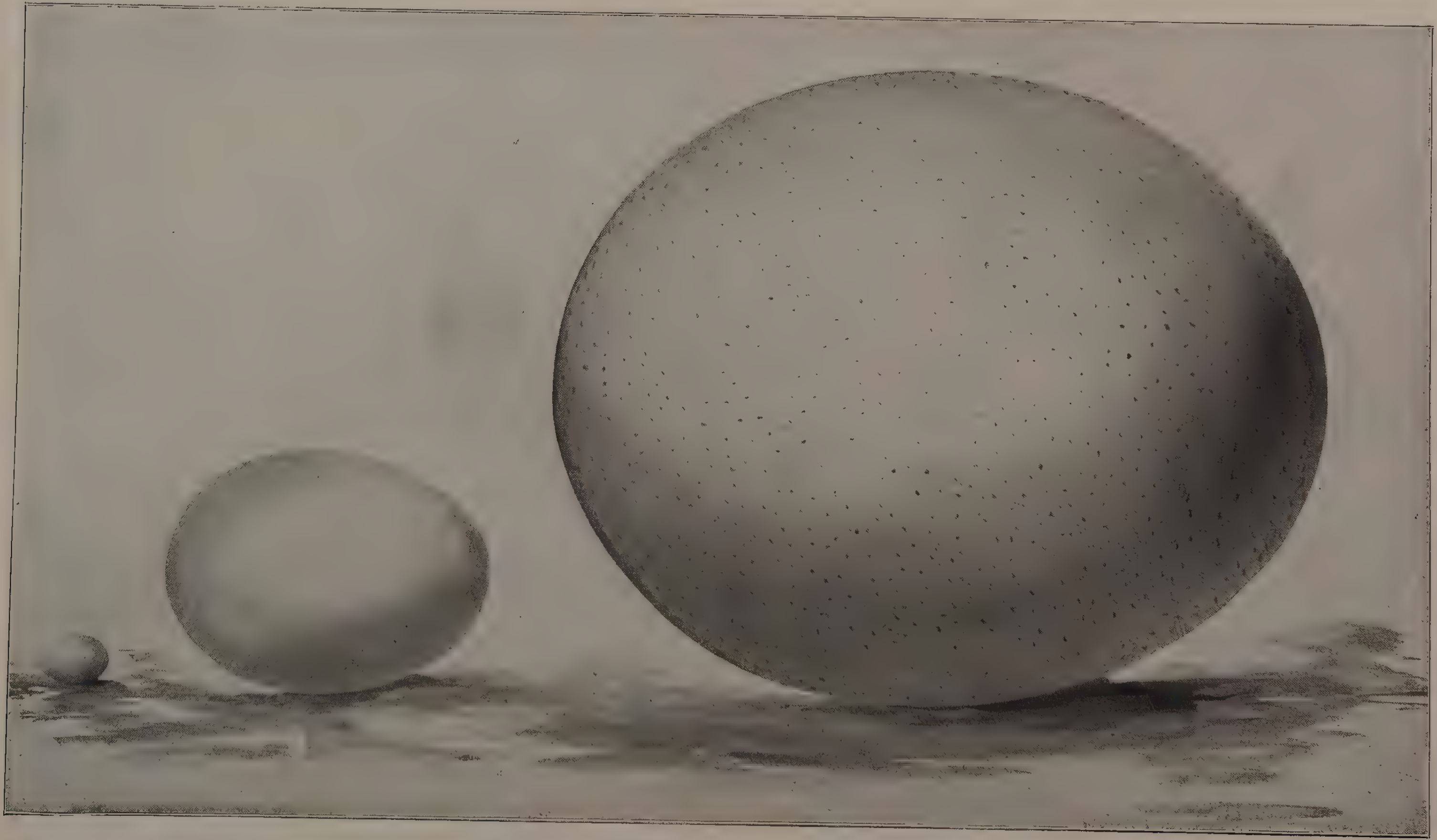
Edwards, Amelia Blandford, English novelist and Egyptologist, was born at London in 1831, and died in Somersetshire, April 15, 1892. In the fifties she began to write fiction, her principal novels being *My Brother's Wife*, *Hand and Glove*, *Barbara's History*, *Half a Million of Money*, *Denham's Vow*, *Lord Brackenbury* and *In the Days of My Youth.* Later in life she traveled extensively, and took a great interest in Egyptian exploration. The fruit of these activities appeared in the following books: a work dealing with the Tyrol, entitled *Untrodden Peaks and Unfrequented Valleys;* an account of some discoveries in the Nile valley, entitled *A Thousand Miles Up the Nile;* and a work on Egyptian archæology and history, entitled *Pharaohs, Fellahin and Explorers* (1891).

Edwards, Jonathan, theologian and philosopher, was born at East Windsor, Conn., Oct. 5, 1703. He early showed a decided taste for learning, and graduated at Yale College in 1720. After acting as a tutor at Yale for a few years, he was ordained to the ministry at Northampton, Mass., where he remained for many years. A dispute with his church led to his resignation in 1750. He next labored some years as a missionary to the Housatonic Indians, at Stockbridge, Massachusetts, until 1758, when he was called to succeed his son-in-law, President Burr, as president of Princeton College, but died of smallpox a month later, March 22, 1758. He has been justly styled the prose Dante of America. Edwards is still America's most original thinker in philosophy, and it is not likely that his treatise on the *Freedom of the Will* will ever be set aside. He was a rigid Calvinist in theology, and his character was one of rare goodness. His description of Sarah Pierrepont, whom he married, is exquisite in spirit, and is a gem of literature. His influence on the thought of New England was large, and many of the greatest American thinkers of the generation which followed him were his pupils. See *Life*, by S. Edwards Dwight; and *Life*, by A. V. G. Allen.

Eel, a bony fish of elongated snake-like form. The eels are found in nearly all waters, both fresh and salt. In the United States they are in all streams of the eastern slope of the continent that connect with salt water. The young ones ascend streams, while the old ones descend the rivers at the breeding-period to lay their eggs on the mud-flats at the mouths of the streams. The discovery of their eggs is recent. In ascending streams they swim through rapids and over dams, but are stopped by large falls and, therefore, there originally were no eels in the Great Lakes above Niagara. They also were lacking in the streams of the Pacific slope. They have no ventral fins, but are powerful and rapid swimmers. They eat fishes, shrimps, crayfish, etc., overturning stones and thrusting their sharp noses into holes and nooks in search of food. They also lie beneath logs or in the mud, and dart out at their victims. They are active at night. They are eaten as food by many people. The common fresh-water eel attains a length of three feet; the conger-eel reaches six feet and more in length. It does not ascend streams like the others. The electric eel is another type.

Eg'bert, king of Wessex, ascended the throne of that country in 802. England at that time was divided into the three kingdoms of Northumbria, Mercia and Wessex. After a struggle with the Mercians, Egbert was recognized as overlord of that kingdom, and not long after Northumbria also accepted him as its overlord. Thus he became the first real king of England, although he did not formally assume that title, and continued to govern Mercia by means of its own king. He died in 837.

Egg, the starting-point of all animal life except the single-celled animals. The latter



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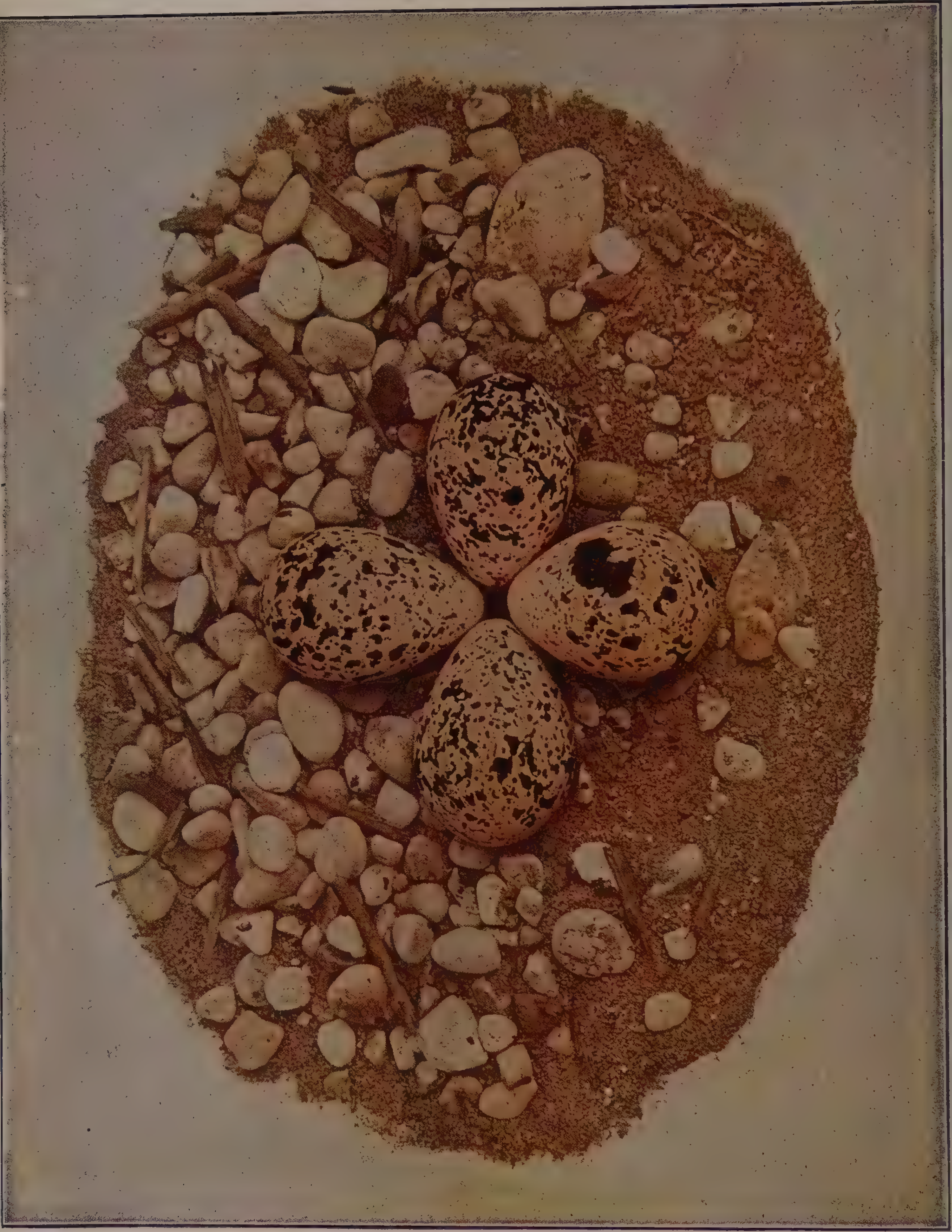
EGGS OF HUMMING BIRD, HEN, AND OSTRICH



FROM COL. CHI. ACAD. SCIENCES

NEST AND EGGS OF KILLDEER
Life-size.

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are produced by division of the body into two similar cells. Eggs begin with the sponges, and occur in all animals above them. The egg is formed within the ovary or egg-producing organ, and in reality is, a modified cell (see Cell-Doctrine) of the ovary. The size of eggs depends on the quantity of food-yolk; for example, the hen's egg is large, because there is much food-yolk in it; frog's and toad's eggs are smaller; and eggs of the starfish are smaller still. The egg is fertilized, and thereafter undergoes development. Insects lay eggs on plant-stems, leaves, bark and other places. Crabs carry their eggs attached to their bodies, spiders lay eggs in cocoons, snails and other mollusks in cases. Many worms lay eggs in capsules. Fishes lay a prodigious number of eggs; for example, a single white-fish will lay upward of 50,000. Frog's eggs are held together in a mass by a jelly-like substance. Toad's eggs are laid in strings. The eggs of snakes, turtles and alligators are laid singly and are surrounded by a leathery shell. They are usually left to be hatched by the heat of the sun. The lowest mammals, like the duck-moles of Australia, are egg-layers. In all the higher mammals the eggs, when undergoing development, are retained within the body. They are very small, because, as the nourishment is supplied by the parent, there is no need of food-yolk. Bird's eggs are of interest to collectors. The largest eggs of living birds are those of the ostrich, which are about six inches in their longest diameter, but there are preserved in museums of Europe some eggs of a gigantic extinct bird of Madagascar, which measured nearly three feet in largest circumference and would hold about two gallons. The wisdom of nature is shown in adapting the shape of the eggs of certain birds to the kind and place of the nest. In case of birds which lay their eggs on bare rocks or ground with little or no attempt at building a nest, the eggs are generally large and round at one end and pointed at the other; they are thus turned around by the wind and not blown away as would be the case if they were of more regular oval shape. Similar adaptation is found in the colors of eggs. The whippoorwill's eggs are laid on a bed of leaves with no nest and are in color much like the leaves and so are not readily seen, and so of the eggs of other birds which are laid in exposed places. A collection of birds' eggs with their great variety of sizes and shapes and the delicate beauty of their colorings is very attractive and interesting. To have value such collections must be made intelligently. The collector should know and record the name of the bird from whose nest an egg is taken; should note where the nest is placed, whether on the ground, or, if in a tree, whether in a hole or on a limb or a swinging branch. Never rob a nest; take not more than one or at most two eggs from one nest. For descriptions of birds' eggs see Davie: *Nests and Eggs of North American Birds;* Bendire: *Life-Histories of North American Birds* (in Smithsonian Contributions to Knowledge) See, also, Development.

Egg-Apparatus (in plants). A group of three cells, one of which is the egg, which develops in the embryo-sac of *Angiosperms.* See Embryo-sac.

Eggleston, Edward, an American author, was born at Vevay, Ind., in 1837, and joined the Methodist ministry while quite a young man. He preached for several years in Minnesota, but in 1866 took to journalism. In 1870 he went to New York, and became editor of *The Independent* and later of *Hearth and Home.* His success as a writer of stories led him to give all his time to that work. In 1871 appeared his *Hoosier Schoolmaster*, which at once gave him a wide reputation. *End of the World, Mystery of Metropolisville* and other works soon followed. In 1879 he began a series of biographies of American Indians. He was a thorough student of American history, and wrote an interesting and valuable *History of the United States.* He died on Sept. 2, 1902.

EDWARD EGGLESTON

Eginhard (*ā'gĭn-hărt*) or, more correctly, **Einhard,** the biographer of Charlemagne, was born in Austrasia (a kingdom of the Merovingian Franks) about 770, and sent to Charlemagne's court, where he soon became a favorite of the emperor. He went with him on all his royal journeys, and was employed in important duties of various kinds. His *Life of Charlemagne* (*Vita Caroli Magni*) is the most important historical work of a biographical sort that has come down to us from the middle ages. It was frequently used as a schoolbook. He is supposed to have died in 840. His *Letters* are also very valuable to the student of history.

Eg'mont, Lamoral, Count of (Prince of Gâvre), was born in Hainault in 1522. After occupying many important positions in the service of the king of Spain, he was appointed governor of Flanders and Artois by Philip of Spain. He now entered into alliance with the party in the Netherlands that was opposed to the Catholic policy of Philip, and from a courtier he became at once the hero of the people. The common opinion is that he was a humane and virtuous patriot who, although he did not care anything about Protestantism as a religion, was anxious to do justice to all the members of that body. When Margaret, duchess of Parma, was made regent of the Netherlands, he and the Prince of Orange entered the council of state and had charge of the few Spanish troops. But when insurrections took place, he broke with the Prince of Orange. He seems to have restored order, and when the Duke of Alva entered the country as lieutenant-general of the Netherlands, Egmont tried to secure his favor, though the Prince of Orange and other chiefs of the insurrection left the country. He seemed to have gained the confidence of Alva, when suddenly he and Count Hoorn were treacherously seized and carried to the citadel of Ghent. He was tried by a court, which, he claimed, had no right to try him, and along with Count Hoorn was condemned, and beheaded in the market place of Brussels, June 5, 1568. A statue now marks the place of their execution. One of the dramas of the great writer, Goethe, has Egmont for its hero. See Motley's *Rise of the Dutch Republic*.

E'gypt, a country in the northeastern part of Africa, between the Great Desert and the Red Sea. It extends from the Mediterranean to the first cataract of the Nile at Assuan. The population is over 10,000,000. Egypt is nominally dependent on Turkey; but under the reigning khedive (Abbas Hilmi) it has since 1883, after Arabi Pasha's rebellion, been practically governed by Great Britain. Sir Eldon Gorst is the English resident-agent at Cairo; while the English army of occupation is under Maj. Gen. Sir Reginald Wingate, K.C.B., who succeeded Lord Kitchener as *sirdar* and governor-general of the Sudan. The area of Egypt is 393,000 square miles, its greatest length being more than 600 miles and its width 500 miles. The chief cities are Cairo (population, 654,476), Alexandria (population, 332 246), Damietta, Tantah, Mansurah, Zagazig, Rosetta, Port Said and Suez. There are in Egypt about 148,000 foreigners, chiefly Greeks, Italians, British and French.

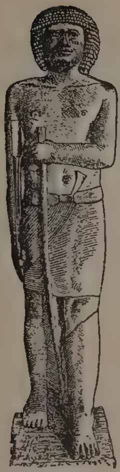
The area of the subject territory, known as the Anglo-Egyptian Sudan, is about 950,000 square miles, with a population roughly computed at 2,000,000. This area extends southward from the frontier of Egypt to Uganda and the Belgian Congo, a distance of about 1,200 miles, and stretches from the Red Sea to the confines of Wadai in Central Sudan. The chief towns are Khartum (population 20,956), the capital, Omdurman (population 42 779), Halfa, Berber, Suakin, Kassala and El Obeid.

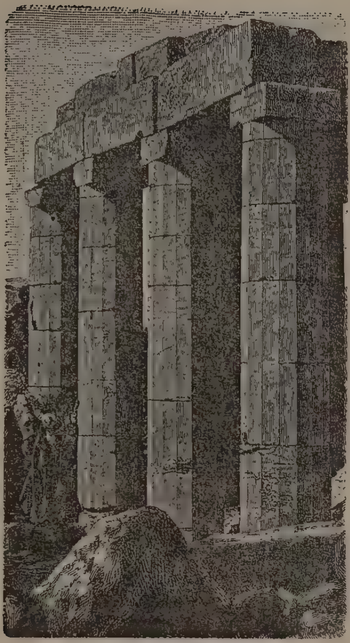
Topography. The main feature of the country is the Nile, with its course of 3,400 miles, which empties into the Mediterranean through two great mouths, its other five having long ago been filled up. The triangular space inclosed between its mouths forms the delta, now called Lower Egypt. The cultivated and settled area of Egypt is that of the Nile valley and delta, comprising 12,976 square miles. A great peculiarity of the Nile valley is the general absence of rain, the land depending on the yearly overflow from the river for the watering. In the middle of July the rise begins to appear, due to rains in the mountainous regions of the south. It reaches its highest point—an average of 35 feet at Thebes and 25 at Cairo—at the end of September, and begins to go down again in the middle of October, falling to its lowest point in April. By the end of November the irrigated land, over which the water has been evenly spread by drains and embankments, has dried and is sown; and in March the crops are ready to be reaped. The course of the river is broken by cliffs and masses of rock which form great cataracts. Over a large extent of the country the rocks are covered with moving desert-sands, and close to the Nile they are covered to a depth of about 30 feet with the soil brought down by its waters.

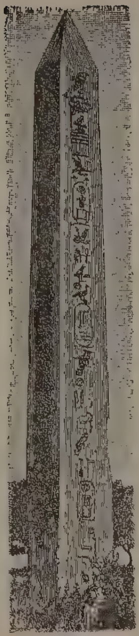
Agriculture. There is an entire absence of woods and forests in the Nile valley. Even clumps of trees, except the palm, are rare. The fig, pomegranate, orange, lemon, watermelon and grape are common fruits, and the most celebrated flower is the lotus or water-lily The ordinary beasts of burden are the ass and camel. Egypt is an agricultural country, and in some parts three crops in one year are raised Wheat is the chief grain; but barley, corn and clover are largely grown. Sugar-cane, cotton, indigo and tobacco are common products. The country is divided into Upper and Lower Egypt, each of these divisions being subdivided into numerous departments and there now being 15 provinces in all.

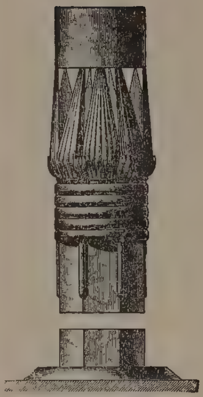
Races and Religions. The people, with the exception of 731,235 Christians, are Mohammedans. They call themselves Arabs, but probably are descended from the ancient Egyptians. The native Christians are called Copts. There also are pure-blooded Arabs, chiefly Bedouins, who live in tents in the desert, with a small number of Turks, Greeks, Armenians, Berbers and Jews. The ancient race probably was of mixed origin, partly Asiatic and partly negro.

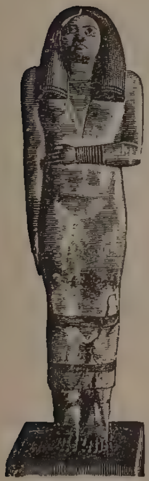
The ancient religion of Egypt was a worship of many gods. The principal cities had each a family-group of gods, consisting of a father-god, a wife or sister and a son; these three were usually accompanied by inferior gods. But the worship of some of the groups of three was universal, and not confined to any one city, that of Osiris, Isis and Horus being found all over Egypt. Special animals were also held sacred, the most common

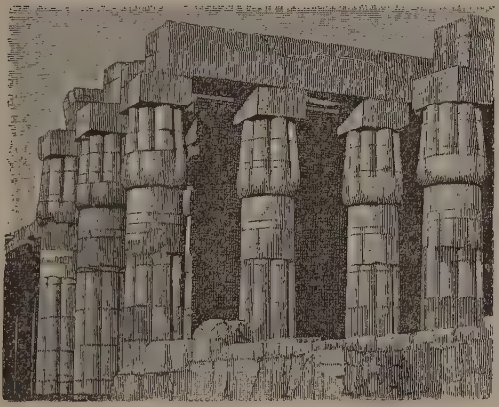

Statue of Sepa

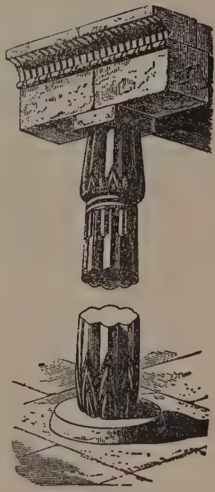

Temple of Karnak

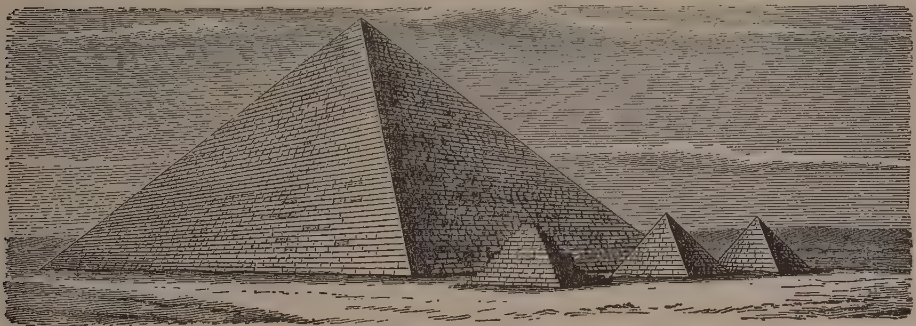

Obelisk


Lotus Column


Statue of Nesa


Ruins of the Temple of Luxor


Papyrus Column Karnak


Pyramid of Cheops

being the bull. The Egyptians also believed that the souls of the dead returned to the body after 3,000 or 10,000 years, and so, by embalming the bodies in spices and wrapping them in cloth, they have been preserved for centuries; many of these mummies have been found at different times. The religious buildings of the Egyptians were either temples or tombs. The great pyramids are royal tombs, having small temples in front. The temples were often covered with sculpture and paintings, and frequently were of great size. In front of them were sometimes sphinxes—figures of lions with men's or ram's heads—and also obelisks or great columns of stone.

History. When the Egyptians first became known in history, they already had a wonderful civilization. They had a knowledge of astronomy, geometry, arithmetic, the geography of their own country, etc. They had a system of picture-writing or hieroglyphics, specimens of which are found on their temples and obelisks. Their knowledge of architecture was considerable, and they evidently had a good degree of engineering skill in order to transport the enormous blocks of stone used in building temples and pyramids. They also showed great skill in sculpture, painting and music. In mechanical arts many inventions were early made, as the blowpipe, bellows, saw, chisel, balance, lever, razor, plow and other agricultural tools. A glazed pottery and a kind of glass are also found. In war, chariots came to be used, though the earlier armies were entirely foot-soldiers. War-boats also existed at an early period, and also sea-going vessels. An extensive commerce was carried on with neighboring nations.

In the 3d century B. C., Manetho, a priest, drew up a history of his country, in which he divided the early history down to the conquest of Egypt by Cambyses II (B. C. 524) into 30 dynasties, but the exact length of the dynasties is unknown. Hence the early history is usually dated simply by dynasties. The earliest point in the history we know of is the time of Menes, who is said to have made laws, begun divine worship and founded Memphis. The period of his life is placed by different authorities all the way from 5004 to 3892 B. C. Menes and his successors reigned for something like 250 years, and formed the first dynasty. The second dynasty lasted for about 300 years, but little is known of it. With the third dynasty, lasting about 200 years, the history which is drawn from the old monuments begins. One of the kings of the fourth dynasty, Cheops or Khufer, built the great pyramid at Ghizeh and rebuilt the temple of Isis near the Sphinx. About 2000 B. C. the Hyksos or shepherd-kings arose in Lower Egypt. They probably were a Tartar race, and overthrew the reigning kings, captured Memphis and established themselves in the city of Tanis. Joseph probably was the prime-minister of one of these kings, Apepi, at Tanis; and storehouses, such as he built are still to be seen at Pithom. The rulers of Upper Egypt afterward drove out the shepherd-kings. Egypt was raised to its highest point of glory by Thothmes III (B. C. 1445); all Syria and part of Mesopotamia were subject to him, and he received tribute from Assyria, Babylon, Phœnicia, Central Asia and the Ethiopian tribes of the south. A later king, Rameses II, carried on a long war with the Hittites, with whom he finally made a treaty. He was a great king, and Egypt was still in the height of her glory during his reign, which was about 1322 B. C. His son probably was the Pharaoh spoken of in the Bible, when the Israelites under Moses left Egypt. His son closed the 19th dynasty. With the 26th dynasty the history of Egypt became involved with that of Greece and Judæa. One of her kings helped Hezekiah against Sennacherib, king of the Assyrians. Necho II planned the canal across the Isthmus of Suez, but gave it up, cutting one from the Nile to the Red Sea that remained in use for centuries. He defeated Josiah, king of Judah, and conquered Palestine, but was himself defeated by Nebuchadrezzar. A later king, Amasis, was a friend of the Greek colonists in Egypt, but was conquered by Cambyses, king of the Persians, and Egypt was under Persian rule for many years. While a Persian province, Egypt was conquered by Alexander the Great, who founded Alexandria in 332 B. C. Under the succeeding Ptolemies the royal court became a center of learning and philosophy, and the great library at Alexandria was established. After the rule of the celebrated Queen Cleopatra, which ended with the battle of Actium (31 B. C.), Egypt became a Roman province. In 639 A. D. the Arabs invaded the country, and Egypt became a Mohammedan province. One of her governors made himself practically independent, and annexed Syria. Later the line of the Fatimi caliphs conquered Egypt and founded Cairo. They were deposed by the Kurd general, Saladin, who carried on the war against the European crusaders. One of Saladin's descendants introduced the bodyguard of *Mamelukes* or white slaves, who on his death usurped the supreme power (1250), and kept it for two centuries. These slave-kings were distinguished for valor, ability as rulers, luxury and encouragement of art. In 1517 their brilliant rule came to an end on the conquest of Egypt by Selim I, the Ottoman sultan.

Nearly three centuries of weak and corrupt government by Turkish governors or pashas, varied by rebellions of the Mameluke chiefs, bring us to the French invasion of Bonaparte in 1798. He conquered the country, but the French were soon driven out by the British, and Egypt was given back to the Turks in 1801. In 1805 Mohammed Ali became pasha. He completely overthrew the Mameluke chiefs, formed a regular army and introduced the beginnings of European civilization. He annexed Nubia and part of the Sudan, and his son conquered Syria. He was succeeded by his grandson, who was superseded by Mohammed Ali's youngest son, Said Pasha. Under Said the Suez Canal was cut by the French engineer, M. de Lesseps, and was opened in 1869. Said was succeeded by his nephew, Ismail, who, a few years later, took the hereditary title of khedive, and soon after bought from Turkey the right to make treaties and maintain an army, thus making himself practically an independent ruler. He began many improvements, such as the building of roads and bridges, the constructing of railroads and telegraphs; he reformed the postal service, improved the harbors, supported education and introduced better courts of law. Through Sir Samuel Baker and Charles Gordon, ("Chinese Gordon"), his governors of the great region known as the Sudan, he suppressed the slave-trade. In order to carry out all his reforms, however, he fell very heavily into debt. Various financiers were sent from England to try to arrange a system of managing the money-matters of the government, and finally England and France were given a controlling influence in the government The khedive's unwillingness to pay the debts due European bankers led the European governments to demand his abdication, and he was deposed by the sultan of Turkey in 1879, being succeeded by his eldest son, Tewfik. A law for the management of the public debt was passed in 1880. Next year Arabi Pasha became minister of war, and finally openly opposed the khedive and European interference, being strongly supported by the natives, who disliked the Europeans. British and French warships were sent to Alexandria in 1882, but the French ships sailed away and the attack was made by the British alone. Arabi withdrew from the city, but large numbers of European citizens were killed by the natives before a force could land to enforce order in the city. Meanwhile Sir Garnet (now Lord) Wolseley was sent out with more troops from England and completely defeated Arabi's army at Tel-el-Kebir. Arabi was banished to Ceylon. Since then England has had a controlling influence in the government. In 1882 began the great rebellion in the Sudan. That region had been governed as a province of Egypt; but Mohammed Ahmed, calling himself the Mahdi (a kind of Mohammedan Messiah), put himself forward to free the Mohammedan faith from her enemies. He captured El Obeid, and completely destroyed an army sent against him under the command of an English officer, Hicks Pasha (1883). His influence spread rapidly, and he gained other important victories. Meanwhile General Gordon was sent out from England to secure the withdrawal of the Egyptian garrisons from the Sudan, Egypt having agreed, by England's advice, to give up most of her possessions in the Sudan. Gordon kept his position at Khartum against the Mahdi, but found he could not get the garrisons away without reënforcements. Unfortunately, England delayed too long in sending the reënforcing expedition, which approached Khartum only to find that it had been taken and Gordon killed two days before (Jan. 26, 1885). The expedition withdrew, and left the Sudan to its native tribes and the Mahdi. Since then the Mahdi has died; but the affairs of the Sudan have, under British energies, taken on an entirely new and greatly improved aspect. This is in large measure due to the valor of General Sir H. H. (now Lord) Kitchener, who in 1892 was made Egyptian Sirdar, and in 1896 was commander-in-chief of an expeditionary force, composed chiefly of Egyptian and Sudanese troops under British officers, who undertook at the order of the English government to reconquer the Sudan. Since the fall of Khartum the English had held the rebellious dervishes at bay at Wady Halfa, as far as the Egyptian frontier then extended. In May, 1896, a brigade of Indian troops was brought from Bombay to Suakim and joined the Sirdar's expedition, which now advanced. By September, Dongola, after sharp fighting, was occupied. The next year, Abu-Hamed and Berber fell before the Anglo-Egyptian onslaught; while in 1898 a dervish-army of 16,000 men, after severe fighting, was worsted on the Atbara, and the khalifa's entire force of 50,000 men was later in the year totally defeated at Omdurman and the city occupied by Kitchener and his gallant force. The dervish slaughter was terrible; but it had its result in the successful reconquest of the Sudan.

Finances and Education. Since 1882 an English army of occupation has remained in Egypt. To meet its cost (the present strength is 6,063) the Egyptian government annually contributes $750,000. The Egyptian revenue, the chief sources of which are the land-tax, the tobacco-monopoly and the customs, amounted in 1911 to over $77,000,000, and the expenditures exceeded $75,000,000. The value of the imports for 1911 was £E27,227,118, and of the exports £E28,598,991. The number of government vernacular schools (primary, technical and special) was 163 in 1911, with a teaching-staff of 900 and an attendance of 27,454 pupils, 6,000 of whom were females.

Railways. Khartum has railway and telegraphic communication with Cairo. The government owns and operates about 1,500 miles of railways in addition to the Sudan military line and the suburban road from Cairo to Helwan. About 800 miles of light agricultural railway are in private hands. The government has built a telephone line from Alexandria to Cairo. There are about 2,500 miles of government-telegraph, 50 telephone-circuits and 350 miles of line. In Dec., 1899, the Sudan was declared open for general traffic. A railway from near Berber to Suakin and Port Sudan was completed in 1905, while other railways are projected. See PYRAMIDS, CAIRO, ALEXANDRIA, SUDAN, GORDON. See Sir Gardner Wilkinson's *Manners and Customs of the Ancient Egyptians;* A. B. Edwards: *A Thousand Miles up the Nile;* S. Lane-Poole: *Egypt;* and Baedeker's *Egypt.*

Ehrenbreitstein (*ā-ren-brīt'stīn*), a town and fortress of Rhenish Prussia. It is situated on the right bank of the Rhine, opposite Coblenz, with which it is connected by a bridge of boats and an iron railroad-viaduct. The fortress is on a high, rocky summit, 387 feet above the river, and is very strong. It was begun in 1672, and was captured by the French in 1799, who blew up the works two years later. It was turned over to Prussia by the Congress of Vienna in 1815, and was soon again fortified. Population of the town 5,299.

Eiffel (*ī'fĕl*), **Gustave,** a French engineer, was born in 1832. He engaged in many important works of engineering, as the construction of the bridge over the Douro at Oporto, the design of the great locks intended for the French Panama Canal and the building of the iron framework of Bartholdi's statue of Liberty. But the work with which his name is most prominently associated is the famous Eiffel Tower on the *Champ-de-Mars,* in Paris, which was completed on March 31, 1889. It comprises three stories, reached by a series of elevators, the platform at the top being 985 feet above the ground. A little less than 7,000 tons of iron were used in building it. The cost was about $1,000,000, of which $300,000 were voted by the government, the rest being supplied by M. Eiffel, who expects to recoup himself by the admission-fees during the 20 years for which they are granted to him.

Ein' Feste Burg. Hymn by Martin Luther, first published in 1538. The words are a revision of *Psalm 46.* Both words and music have been changed for the sake of greater conformity to the spirit of modern ideas. The composers Bach, Mendelssohn, Nicolai, Raff, Wagner and Meyerbeer have all employed this stirring choral in various vocal and instrumental compositions.

Eisenach (*ī'zen-äk*), a town of Germany, in Saxe-Weimar, on the northwestern edge of the Thuringian forest. The castle of Wartburg stands 600 feet above the town. It was built in 1067, and was the home of St. Elizabeth and also the ten months' asylum to which Luther was borne by the elector of Saxony in 1521. It also was the birthplace of Bach, the great composer. The chapel in which Luther preached, with the room he occupied and in which he overcame the Evil One by throwing an inkstand at his head, is still pointed out The town has a population of 35,153.

Eland. See ANTELOPE.

E'lastic'ity, a general property of matter, which may be briefly but roughly defined as the resistance which a body offers to a change either of size or of shape. A more accurate definition is the already classical one of Lord Kelvin, which runs as follows: "Elasticity of matter is that property in virtue of which a body requires force to change its bulk or shape, and requires a continued application of the force to maintain the change, and springs back when the force is removed, and, if left at rest without the force, does not remain at rest except in its previous bulk and shape."

When two or more forces are applied to a body in such a way that their resultant is zero, there is no acceleration, and no evidence, therefore, from the motion of the body, that such individual forces are acting. Such forces are said to be in equilibrium. A pair of forces in equilibrium is called a stress. The change in shape or size which results from such a stress is called a strain. And the elasticity of any body is measured by the ratio of the stress to the corresponding strain. Thus:

$$\text{Elasticity}=\frac{\text{Stress}}{\text{Strain}}$$

In nature we meet practically three kinds of stresses. To each of these three stresses corresponds one kind of elasticity, each of which is included, however, in the general definition given above. We proceed to consider these three types of stresses.

I. ELASTICITY OF LENGTH

When a force is applied to a body in such a way as to alter its length, either by compressing it or stretching it, the force is necessarily distributed over the cross-section of the body. The longitudinal stress at any point in a body is defined as the ratio of the force to the area at that point. A longitudinal stress always produces an elongation of the body to which it is applied. The total change in length depends not only upon the stress but upon the original length of the body. Accordingly the longitudinal strain is defined as the ratio of the total elongation to the length. Now the elasticity of length for any material is measured by the ratio of the longitudinal stress to the longitudinal strain. And hence for this ratio, which is generally known as Young's modulus, we have

$$\text{Young's Modulus} = \frac{\text{Longitudinal stress}}{\text{Longitudinal strain}}$$

If a force F, applied to a wire of cross-section a and length L, produces an elongation e, then

$$\text{Young's Modulus} = \frac{\left(\frac{F}{a}\right)}{\left(\frac{e}{L}\right)} = \frac{F\,L}{e\,a}$$

This is the equation employed by engineers in computing the proper cross-section of the ties in a bridge.

II. ELASTICITY OF VOLUME

Let us denote the volume of a body by V. Imagine the volume to be subjected to pressure, so that it is diminished by an amount v. The ratio of the diminution to the total volume is called the voluminal strain. Suppose further that this change of volume has been produced by applying a force F to a surface of area a; as, for instance, when air is compressed in an ordinary bicycle-pump. The ratio of the total force to the area over which it is applied is the voluminal stress; and is what we call pressure. In accordance with our general equation, the elasticity of volume for any material is measured by the ratio of the voluminal stress to the voluminal strain. This ratio is generally known as the bulk modulus, and is commonly denoted by k.

$$\text{Bulk Modulus} = k = \frac{\text{Voluminal stress}}{\text{Voluminal strain}}$$

$$k = \frac{\left(\frac{v}{a}\right)}{\left(\frac{v}{V}\right)} = \frac{F\,V}{a\,v}$$

The reciprocal of the bulk modulus is what is known as the compressibility of a substance.

III. ELASTICITY OF SHAPE

When a rod or shaft is twisted, the two surfaces which face one another at any cross-section of it are displaced one over another in exactly the same way (though not to the same extent) in which they would be if cut in two by a pair of shears. Such a strain is called a shearing strain, and the stress (force per unit area) is called a shearing stress. The ratio of the shearing stress to the shearing strain is called the rigidity modulus.

$$\text{Rigidity modulus} = \frac{\text{Shearing stress}}{\text{Shearing strain}}$$

The rigidity modulus of any material measures its ability to resist a shear, and hence its fitness for mill-shafting, for propeller-shafts of steamships, etc. A quantitative discussion of rigidity would be too long for our limited space, but may be found in any good treatise on strength of material. Elasticity of shape is employed as a criterion by which to divide all bodies into two fundamental groups: solids and fluids. Solids are defined as those bodies which exhibit both elasticity of shape and elasticity of size. Fluids are bodies which possess elasticity of size but do not possess elasticity of shape. Bodies which exhibit no elasticity are called rigid. They do not exist in nature; but there are many bodies which we may, without error, treat as rigid. See Watson's *Physics* or Minchin's *Statics* for an excellent account of this subject. HENRY CREW.

El'aters (in plants). Peculiar cells which develop among the spores in the spore-cases of many liverworts, as *Marchantia.* They are long, slender and spirally thickened, and by their jerking movements help to scatter the spores. See HEPATICÆ.

Elba. See NAPOLEON.

Elbe, a large river of northern Europe, takes its rise from the flowing together of many small streams which have their origin on the southern side of the Giants' Mountains on the northern border of Bohemia. Its total length is about 725 miles, and it is navigable for 525 miles, but for sea-vessels only up to Hamburg (84 miles). Of its many tributaries the most important are the Moldau, Eger, Mulde, Saale and Havel, and in connection with these is a fine system of canals. The general direction of the river is northwestward, and it empties into the North Sea at Cuxhaven, where its mouth is ten miles wide. Within the mouth, which really is an arm of the sea, the tide rises about ten feet. The numerous islands between Hamburg and Harburg divide the river into several branches, and between Hamburg and the sea the sandbanks and shoals leave only a very narrow channel. The navigation was formerly hindered by all sorts of tolls, but these were all abolished in 1870.

Elberfeld (*ĕl'bĕr-fĕlt'*), one of the manufacturing capitals of Germany, is situated 16 miles from Düsseldorf, on a small stream flowing into the Rhine. The town is famous for its dyeing, bleaching and calico-printing establishments; also for large manufactures of cotton, silks, tapes, ribbons, thread, lace, buttons, fancy woolen goods, etc. Its Turkey-red dyeworks are especially noted. There also are manufactures of machinery, iron and steel wares, pianofortes, paper and carpets, besides large breweries. For miles around an immense number of weavers labor for the Elberfeld factories. Population, 170 118

El'der. A species of *Sambucus*, a genus belonging to the honeysuckle family. They are shrubby plants with pinnately compound leaves and numerous small white flowers in flat clusters, followed by the characteristic black, purple, red or (rarely) white berries. The stem contains a conspicuous pith. The genus contains about 20 species widely distributed, about five occurring in the United States. The two eastern forms are *S. canadensis*, the American elder, with purple or black berries; the other is *S. pubens*, the red-berried elder.

El′don, John Scott, an English lord-chancellor, better known as Lord Eldon, was born in 1751. After studying at Oxford University for some years, he took to the law and soon gained great success as a lawyer. He entered the house of commons in 1783, was knighted and appointed solicitor-general in 1788, and made attorney-general in 1793. In 1799 he was appointed chief-justice of the court of common pleas, and in 1801, as Baron Eldon, he became lord-chancellor, a position he held, with only a short intermission, for twenty-six years. He died in 1838.

El Dorado (*ĕl′dō-rä′dō*), meaning the golden or gilded land, was a country supposed by the Spanish discoverers of America to exist somewhere in the New World. Their imaginations were fed by stories of the natives, and after the voyage of Orellaña down the Amazon in 1540 the report was greatly enlarged, and the locality of the fabulous region was placed near the headwaters of the Orinoco. Many a soldier of fortune perished in the search for it, and many a troop of adventurers came back with only a small part of their original number, before the city of gold was reluctantly looked upon as a fable of greedy minds, which liked to dream of greater rewards than the riches of Mexico and Peru. The most famous expeditions were those of Philip von Hutten and of Sir Walter Raleigh; a subsequent quest was that of Antonio Santos as late as 1780. See Von Langegg's *El Dorado.*

Elections. An election is the act of selecting a person or persons for some office. Elections often take place at stated intervals in connection with clubs, societies and similar organizations, with a view to having the different offices of the organization filled by the best available persons.

An election in politics is the act or process of publicly choosing by vote a person or persons for public office. In general, the most important political elections are those for the legislative bodies of the various countries and, in republics, the election of the president. It has been found necessary to pass many laws for the regulation of important elections, with a view to the prevention of bribery and corruption. In the United States, Federal laws regulate the election of Federal government-officials, such as the president, vice-president and members of Congress, while state-laws regulate the election of state officials. Voting is now usually by ballot.

A ballot formerly signified a little ball used in secret voting, But voting by ballot has now come to mean simply secret voting, irrespective of the particular means used. The commonest form of ballot now in use is that of a ticket, with the names of the candidates for the office printed upon it. The voter casts his vote by putting some mark, such as a cross, opposite the name of the person or persons for whom he wishes to vote. Sometimes the names of all of the candidates are arranged in separate columns on the ballot, all the Republican candidates in one column, all the Democrats in another, etc. One object of this is to encourage the voter to vote a straight ticket, that is, to vote for all the candidates of the one party to the exclusion of all the candidates of the other party. The expense of preparing and distributing the ballots is now usually borne by the state.

A majority is simply the excess of votes that one party receives over another party or parties at an election. For instance, if A receives 100 votes, B 80 and C 60, A has not a majority, as he received only 100 votes out of 240, or less than half of the total number of votes cast. If A had received 200, B 80 and C 60, A would have a majority of 60.

A plurality, on the other hand, is the number by which the votes for the highest of a number of candidates exceed those of the next highest candidate, when the candidate receiving the greatest number of votes has not a majority of all the votes cast. Thus, if A receives 100 votes, B 80 and C 60, A has a plurality of 20, having 20 more than the next highest candidate B. Sometimes the word majority is loosely used in the sense of plurality.

A primary election is the means used to nominate the candidates for office in a general election. Only members of the particular party concerned take part in in it; that is, there are Republican primaries for nominating the candidates of the Republicans and Democratic primaries for nominating the Democratic candidates. In many places the primary elections have at times degenerated into selfish partisan organizations from which the majority of the voters of the party were excluded. Abuses of this nature have led to the passing of laws in many states for rigidly regulating the primary elections. These laws in the main provide that sufficient public notice of the meeting shall be given, that the voting shall be by ballot, that the election-officials shall be sworn, that frauds shall be duly punished and that the expense involved, except in a few cases, shall be borne by the state.

Electoral College. The persons who, according to the political system of the United States, are chosen by the people of the different states to elect the president and vice-president are called electors, and the electors of all the states form the electoral college. Each state chooses a number of electors equal to the number of members it sends to both houses of Congress; but no member of Congress or person holding civil office under the United States can serve as an elector. The electors are chosen on the Tuesday after the first Monday in November in every fourth year preceding the year in which the presidential term expires. They meet in their respective states on the second Monday in January, and cast their votes. They were originally intended to use their own judgment in casting their votes, but now they simply vote for the candidates nominated by the party by which they have been chosen as electors. The votes are then opened and counted by both houses of Congress, in joint session, on the second Wednesday of February. If no candidate has a majority of all the votes, the house of representatives chooses the president by ballot from the three who have the highest number of votes, each state having one vote; the vice-president is similarly chosen by the senate. See Johnson's *American Politics* and Andrews' *Manual of the Constitution.*

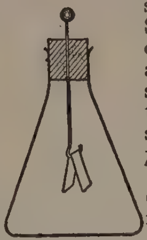
Electricity. The rubber handle of a fountain-pen when rubbed over the sleeve of one's woolen coat, acquires the property of attracting small bits of paper or wood; glass rubbed on silk behaves in the same way. The substance earliest discovered to have this property is amber, a fossil resin found on the shores of the Baltic Sea. The Greeks called this resin electron, and hence later (1603 A. D.) Dr. Gilbert called this phenomenon electric, and gave us our word *electricity.* These facts have been known ever since the time of Thales (600 B. C.); and for two thousand years following him they constituted the whole of electric science, barring some knowledge of lightning and the electric eel, which no one then imagined to have any connection with the amber phenomenon.

Bodies which have acquired the property of attracting small bits of paper are said to be electrified or to have an electric charge.

I. ELECTROSTATICS

The fundamental facts upon which the science of electrostatics (*i. e.*, the science which deals with electric charges) is built, are as follows:

1. From a large number of experiments it has been found that not only rubber or amber but *any* substance, on being rubbed with any other substance, becomes electrified. Even the tip of a camel's-hair brush, when touched to a table-top, shows electrification. Of course this requires some delicate means of detecting the electrification, such as a pair of gold leaves suspended on a glass support. Such an instrument is called an electroscope and is shown in fig. 1. Since electrification is produced by such slight means, we are led to think that "any two substances brought into contact become electrified." This statement may be called the *first law of electrostatics.*



Electroscope made of Erlenmeyer Flask and Aluminium Foil

2. A second fundamental discovery in electrostatics was made by Stephen Gray (died 1736) in London. He found that when some bodies, such as metals, are electrified, the charge immediately leaks off unless the metal be supported upon glass, rubber, resin, etc. Those substances which lead off the charge quickly, he called conductors; those which prevent the charge from escaping, he called non-conductors or insulators. There are some substances, as gas, carbon, ordinary water, cotton-thread, which occupy an intermediate position between conductors and non-conductors. See list in any good treatise on electricity.

3. A third great discovery in electrostatics was made by Dufay (see DUFAY), who found that all electrified bodies may be divided into two classes according as they attract or repel a given electrified particle—such as a pith-ball suspended by a silk thread and charged. The electrification which appears on glass when rubbed with silk Dufay called vitreous; we now call it positive. That kind of electrification which appears on sealing-wax or gutta-percha when rubbed with flannel, he called resinous; we now call it negative. Bodies charged with the same kind of electrification repel each other; bodies charged with opposite kinds of electrification attract each other.

4. Just "how much" two charged bodies attract (or repel) each other was first measured by the French physicist Coulomb (born 1736; died 1806). His answer constitutes what we may call the fourth great discovery in electricity. By means of a torsion-balance he found that two particles at a distance r from each other, and carrying charges e and e 1 respectively, attract or repel one another, *in air*, with a force F, which is given by the following equation:

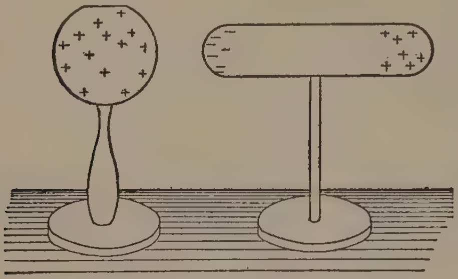
$$F=\frac{ee'}{r^2}$$

Cavendish and Faraday found later that this expression had to be modified, when the medium between the two particles was other than air, so as to read:

$$F=\frac{ee'}{Kr^2}$$

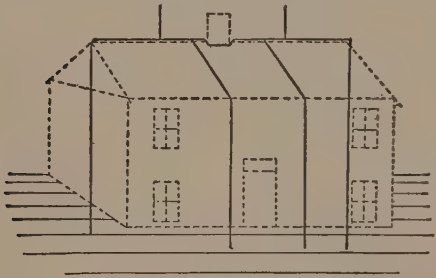
where K is a constant which is known as the specific inductivity of the medium: for ordinary glass its numerical value is about six, for paraffine about two.

5. Stephen Gray found that he could charge a conductor by simply bringing it into the field of another charged body. If now the conductor be connected to earth and immediately afterward disconnected, it will be charged with electrification opposite in sign to that of the original charge. This is known as the phenomenon of electrostatic induction, and will be clear from Fig. 2.



The phenomenon of electrostatic induction

6. A sixth important fact was thoroughly established by Faraday: When electrification is produced by friction, by induction or by any other means, the positive and negative charges so produced are always equal.



Maxwell's method of protection against lightning

7. Faraday also established the fact that the charge on the outside of any closed conductor is distributed in such a way that it produces no electric field—no electric force—inside the closed conductor. It was with this principle in mind that Maxwell suggested, as the best method for protecting houses from lightning, to place them in a network of conductors (see fig. 3) which shall as nearly as possible be equivalent to a closed conductor. For more extended description of the phenomena of electrostatics see S. P. Thompson's *Elementary Lessons in Electricity and Magnetism.* For a simple and interesting mathematical discussion of the subject see J. J. Thomson's *Elements of Electricity and Magnetism.*

II. ELECTRIC CURRENTS

If two charged conductors are connected by means of a wire, it is observed that in general the wire and the region about it acquire new and remarkable properties. The wire itself becomes warmer, and the region about it becomes a magnetic field. A wire which possesses these properties is said to have an electric current flowing through it. For methods of detecting the presence of an electric current in any circuit see GALVANOMETER.

There are many methods of producing electric currents but the most important ones from a practical point of view are the three following: the method of Galvani and Volta—the so-called voltaic cell; the method of Faraday—cutting lines of magnetic force—exemplified in the ordinary dynamo; and the thermo-electric method discovered by Seebeck.

THE VOLTAIC CELL

Volta discovered in 1800 that, by joining in series two conductors of the first class (see ELECTROLYSIS) and one conductor of the second class, he could obtain a continuous electric current at the expense of the chemical energy stored up in the liquid and the metals. Two conductors of the second class, together with one of the first class, will also produce a continuous current. Such a combination as either of the preceding is called a voltaic cell. A typical cell of this kind is one in which a strip of zinc is immersed in a solution of zinc-sulphate and a copper strip in a solution of copper-sulphate, the two solutions being separated by a porous partition. It is then found that, on joining the copper and zinc terminals with a wire, the positive electricity flows along the wire from the copper to the zinc. Accordingly, the copper is called the positive pole and the zinc the negative pole of the battery. Since, however, inside the cell the current flows from the zinc to the copper, the zinc-plate is called the positivee lectrode and the copper-plate the negative electrode. (See ELECTROLYSIS.)

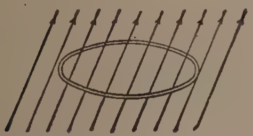
There is a great variety of cells; some adapted to one purpose, some to others. The one just described is known as the daniell cell. In the storage-cell the electrodes are of lead and lead-peroxide respectively, and the electrolyte is dilute sulphuric acid. The lead-plate is the negative one; the lead-peroxide is the positive one. When the circuit is closed, the lead-peroxide plate gives up a part of its oxygen, while the lead-plate, the negative electrode, becomes oxidized, until finally the two electrodes become very much alike and the current, therefore, becomes less and less, other things being the same. The battery is now said to be discharged. For two electrodes which are alike never give a current when immersed in any one electrolyte. But in order to put the cell again in good working shape, it is necessary only to pass an electric current through the cell in a direction opposite to that obtained when the cell was in use. This process is known as *charging* the cell. The charging simply restores the oxygen to the positive plate, and removes the oxygen from the negative plate, leaving it spongy, metallic lead.

The following two features distinguish this from most other voltaic cells: The plates are prepared, *i.e.*, made chemically different, by electrical means. They are capable of yielding currents which are enormous when compared with those from other forms of batteries.

INDUCTION OF ELECTRIC CURRENTS

Faraday in 1831 succeeded, by a beautifully simple method, in producing electric currents without the use of the voltaic cell and without the use of heat.

If we consider any closed circuit (say a piece of copper wire bent into the form of a circle or square) placed in a magnetic field, we may think of it as containing or inclosing a number of lines of force, as a fence might inclose a group of trees. In Fig. 4 six lines of force are represented as inclosed by the wire-circle. If by any means the magnetic field were made twice as strong, we should represent this change by drawing the lines of force twice as close together, so that now the circle would inclose twelve instead of six lines. Or, if the copper-circle were carried parallel to itself to another region where the magnetic field were not so strong, then we should describe this change by drawing fewer lines of force through the circle. Faraday's discovery was simply this: "When, by any means whatever, the total number of lines of force passing through any circuit is changed, an electric current is produced in that circuit." Such a current is called an induced current.


Magnetic Line of Force inclosed by an Electric Current

This discovery of Faraday's is frequently, and perhaps fairly, considered the most important one ever made in electrical science; since upon this principle are constructed the dynamo, the telephone, the transformer, etc. See articles on these three subjects.

THERMO-ELECTRIC CURRENTS

Seebeck in 1821 discovered that, when a closed circuit is made up of two different metals and the two junctions of the metals are kept at different temperatures, an electric current flows around the circuit. The source of energy which supplies this current is the heat absorbed at the hot junction. The presence of such an electric current as this in a circuit is one of the most delicate tests known for a difference of temperature between the two junctions.

EFFECTS OF ELECTRIC CURRENTS

1. *Chemical Effects.* (See ELECTROLYSIS.) One of the chemical effects of an electric current has been employed to define the size of the unit of current, for the international congress of electricians at Chicago in 1893 agreed to define the unit-current as one which deposits silver at the rate of 0.001118 grams per second. This unit is called an ampère. See AMPÈRE.

2. *Heating Effects.* Everyone who has seen an incandescent lamp knows that an electric current in passing through a carbon filament may raise its temperature to such a point that the carbon becomes white-hot. Joule, the English physicist, showed that the amount of heat developed between any two points in a conductor varies directly as the square of the current, directly as the time and directly as a constant depending upon the shape, size and chemical composition of the wire. Let us denote the heat developed by H, the current by C, the time by t and the constant for any conductor by R. Then by properly choosing this constant we may write:

$$H = C^2Rt.$$

The constant R thus defined is known as the electrical resistance of the wire. The resistance of a wire may then be considered as a quantity which determines how much heat will be developed in it in a given time by a given current. The size of the unit of resistance is that offered by a column of mercury of uniform cross-section, at 0°C, when its length is 106.3 centimeters and its mass is 14.4521 grams. This unit is called an ohm.

3. *Magnetic Effects.* About every wire conveying a current is a magnetic field. This field may be represented by drawing closed lines of force including the current. It is these lines of force which magnetize a piece of iron placed in a coil of wire carrying a current. The behavior of the electromagnet and the telegraph-sounder depends upon this principle. An exceedingly important inference from this magnetic effect is the fact that an electric current, in any movable circuit, always sets itself so as to include as many lines of force as possible. This is the principle of the instrument which Lord Kelvin devised in 1867 for receiving messages over the Atlantic cable. It is, indeed, the principle of all galvanometers with movable coils and of all electric motors.

OHM'S LAW

A dynamo or a voltaic cell may be considered as an instrument for driving an electric current through a circuit or, in short, as an instrument for producing electrical pressure. Ohm, a German mathematician, showed in 1827 that

1. When, in any circuit, the electrical pressure remains constant, the current varies inversely as the resistance. 2. When, in any circuit, the current is to remain constant, the electrical pressure must be varied directly as the resistance varies. 3. In any circuit in which the resistance is kept constant, the current varies directly as the electrical pressure.

These facts together constitute Ohm's law, and may be expressed algebraically as follows: When C denotes current, R resistance and E electrical pressure, then

$$C = \frac{E}{R}$$

The quantity which we have called electrical pressure is generally called electromotive force. The unit of electromotive force is that which will send a current of one ampère through a resistance of one ohm. This unit of electromotive force is called a volt. Electromotive force is very frequently denoted by E. M. F. The E. M. F. of a daniell cell is very nearly one volt; that of a lead storage-cell is approximately 2.1 volts.

ELECTRICAL UNITS

These three units, the ampère, ohm and volt, whose standard values we have given above, are all logically connected with the three fundamental units, the centimeter, the gram and the second; but the reasoning which leads to the arbitrary definitions given above is too long for this brief sketch. For a full account of this matter see Thomson's *Elements of Electricity and Magnetism* or Thompson's *Elementary Lessons in Electricity and Magnetism*.

HENRY CREW.

Electric Lamps are of two kinds: arc and incandescent. Both depend upon the general principle that the heat developed in any part of a circuit by a constant electric current varies directly as the resistance of that part of the circuit; or, what is the same thing, the heat developed in an electric circuit by a constant electromotive force varies inversely as the resistance. (See ELECTRICITY.)

THE ARC-LAMP

The arc-light was first employed by Sir Humphry Davy, but it became a commercial success only after the modern dynamo had been perfected, say about 1876. An arc-lamp consists generally of two carbon-poles connected with some source of current exerting an electrical pressure of from 30 to 90 volts between the terminals of the carbon. The arc is started by bringing the carbon-poles into contact, and then slowly separating them by a distance of a millimeter or more. The resistance of the vapor thus formed between the poles is so large, that an enormous amount of heat is developed and the ends of the carbon-poles become white-hot. The positive pole becomes much hotter than the negative pole, so that for purposes of illumination the positive pole is generally placed above the negative one; and when the arc is used in a projecting-lantern the positive pole is always made to point forward, *i.e.*, toward the screen. The temperature of the arc is unknown, but an average of the best measurements indicates that it is about 3,600° C. Owing to the fact that the oxygen of the air is electronegative, the positive pole is consumed about twice as fast as the negative. Hence the arcs used for street-lighting (and therefore automatically fed) are so arranged that the positive carbon is fed in twice as rapidly as the negative. These street-lights are always arranged in series, from twenty to fifty being placed on each circuit, according to voltage. Within the last few years the arc-lamp has been greatly improved by inclosing it in a small glass-hood, which prevents easy access of air and thus greatly lengthens the life of the carbon. This hood at the same time acts as a diffusing screen, and greatly ameliorates the fierceness of the light.

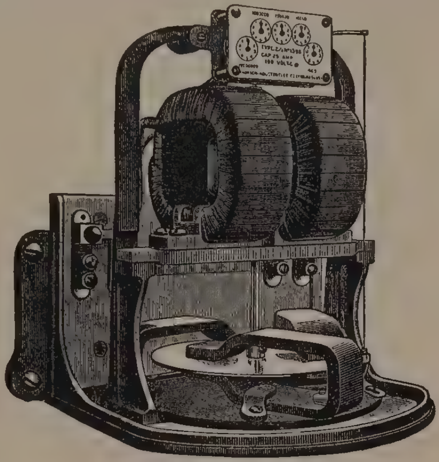
THE INCANDESCENT LAMP

The incandescent lamp, such as has been used for the last quarter of a century, was perfected by Edison in 1878; and, in its commercial success, naturally followed that of the dynamo. It consists essentially of a slender filament of carbon inclosed in a perfect vacuum. The resistance of this carbon-filament, varying from one or two ohms to several hundred ohms, is very high compared with the resistance in the rest of the circuit, so that nearly all the heat is developed inside the glass-bulb which incloses the carbon-filament. The source of current usually employed for incandescent lighting either is a dynamo giving a constant voltage or a storage-battery. Lamps suited to this particular voltage are placed in parallel between the "lead" wires, which come from the dynamo or battery. Most incandescent lamps are made with filaments which become white-hot under a pressure of 50 to 55 volts and from 100 to 110 volts. The amount of candle-power which a lamp gives, when fed at its proper voltage, is determined by the length of the filament, so that for any particular voltage lamps may be had giving generally any candle-power between 8 and 100. In 1899 Nernst, the German chemist, devised an incandescent lamp which requires no vacuum and is said to consume only half the power of the ordinary carbon-filament. The Nernst filament consists of a short rod of magnesium-oxide, which is a poor conductor of electricity when cold, but becomes a good conductor on being heated. To start the light, it is necessary, therefore, either to apply a match or to heat it with an electrically heated platinum wire. It is almost needless to add that they are patented in all civilized countries. For the various methods of distributing incandescent lamps, the three-wire and five-wire systems, etc., see any good treatise on electric engineering.

Electric-Light Bug, a large water-bug common in the United States. The bugs fly readily from pond to pond. Formerly they attracted no general attention; but, since our cities have been lighted by electrical lights placed on high elevations, they are at times very common in cities. They fly into the electric light and are killed by hundreds and have been the occasion of frequent mention by the public press. They are not, however, of recent appearance in this country, as is sometimes supposed. They are true bugs, living in the water, with a sharp beak used for puncturing their prey. They attack snails, small fish and, occasionally, a frog, and suck the blood. They reach a length of more than two inches, and have long been known to observers of insects under the names giant water-bug and water-scorpion.

ELECTRIC BUG

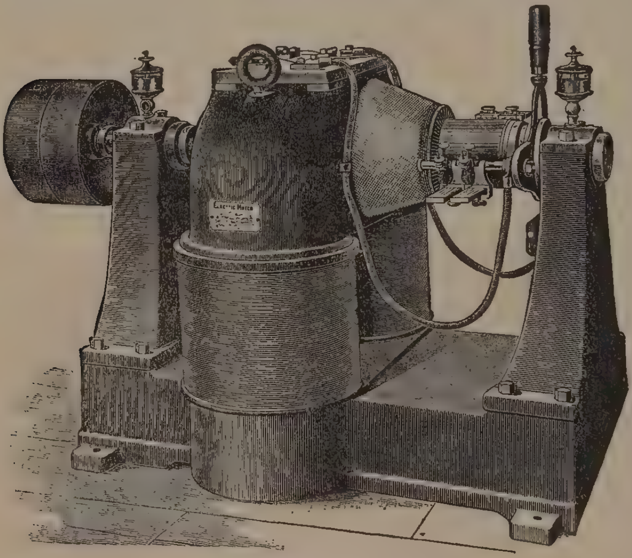
Electric Meter, a piece of apparatus for measuring and recording the electric energy consumed in a circuit. Several forms of electric meter have been devised, but the only kinds in general use are the clock and the motor-meter. The clock-form of meter is much used in Europe, but not in the United States, In the Aaron meter, a clock-form, the pendulum of a clock has a magnetic bob, which swings over a coil carrying the current, and thus the change in the rate of the clock depends on the current. This change in rate is recorded on one or more dials, and these are graduated in electrical units. The only meters in general use in the United States are motor-meters. A motor-meter is a small electric motor so made that the number of revolutions of the armature is proportional to the electric energy consumed in the circuit in which the motor is placed. The total number of revolutions is recorded on a dial by a simple mechanism. The meter is usually incased like a gas-meter with only the dial visible. Electric meters record in some unit representing power multiplied by time, as watt-hour, measuring a watt of electric energy for one hour, or lamp-hour, measuring the energy required to run one 16-candle-power incandescent lamp for one hour. For incandescent-lighting circuits where the pressure remains constant, the meter need record only current (ampères), but on motor-circuits the meter must be a true watt-meter, that is, record pressure times current (volts × ampères).


AN ELECTRIC METER

Meters are either for direct or for alternating circuits. A. C. meters are usually some form of induction-motor. (See ELECTRIC MOTOR.) Among the best-known electric meters are the Shallenberger, Thomson and Stanley meters. Meters are now used by most large central stations in measuring electric energy supplied for all purposes. The accuracy for their whole range of loads is within 2% for the best meters, while for mean loads the accuracy is much greater.

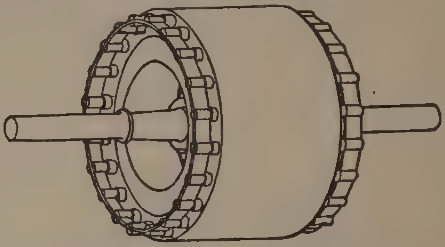
Electric Motor, a machine for transforming the energy of an electric current into mechanical power. The modern direct-current motor may be looked upon as a reversed dynamo. In fact, any direct-current generator will run as a motor if current is passed through its armature and field-magnets, and in general an efficient generator is an efficient motor. But not all electric motors are good generators, for motors are often constructed for special purposes. Thus the street-car motor, for obvious reasons, is made with light field-magnets. But the general description of a D. C. dynamo applies directly to a D. C. motor.

An alternating-current dynamo will run as a motor when supplied with the proper alternating current, provided it is first brought up to its normal speed as a generator. After that it runs synchronously with the generator, unless overloaded, when it will stop. Such a motor is called a synchronous motor. Synchronous motors have the disadvantage of requiring an auxiliary starting-motor. They are seldom used, except in very large plants where the load is required continuously. There are several long-distance transmission-plants in the Rocky Mountains using synchronous motors. All practical self-starting A. C. motors are induction-motors. This motor is based on a discovery of Professor Ferraris of Turin University, Italy, but the first commercial induction-motors were due to Tesla. The armature of an induction-motor is a closed coil without commutator, collector-ring, brushes or external circuit. The multipolar field-magnets are excited by two or more alternating currents which differ in phase. By proper windings and connections of the coils of the field-magnets, there is thus produced a magnetic field which changes both strength and direction, a so-called rotary field. This induces currents in the armature-coils, and carries the armature with it. Induction-motors are self-starting, are simple in mechanical construction, require little attention in operation and are efficient; but they require two or more separate currents to operate them. These currents, however, are generated by a single dynamo. Induction-motors at present are not adapted for purposes where the speed has to be varied, as on street-cars. For small motors, such as fan-motors, the two phases can be obtained by splitting a single-phase current, but this method has not been successfully used on large motors. Both two and three phases are used in A. C. motors.



A DIRECT-CURRENT MOTOR

The first persons to make practical use of electric motors were Jacobi, Davenport and Page. Jacobi ran a boat carrying 14 passengers at St. Petersburg in 1838. Davenport had an experimental electric railroad at Springfield, Mass., in 1835. Page ran a 16 H. P. electric locomotive at a speed of 19 miles per hour on the railroad between Washington and Baltimore in 1851. All obtained their electric currents from primary batteries. The first case of running a motor from a dynamo was that of Fontaine and Bregnet, at the Vienna exposition in 1873. The distance between the generator and motor was over a mile. Electric motors are now used in every place where power is needed. The fact that in many shops electric motors are placed on each machine, the motor-efficiency being higher than that of shafts and belting, speaks for the efficiency of the modern electric motor. A reliable engineer in the *Engineering Magazine* estimates the aggregate power of the electric motors in use as not less than one and a quarter-million horse-power. (See, further, TRANSMISSION OF POWER and ELECTRIC RAILWAY.) A. P. CARMAN.

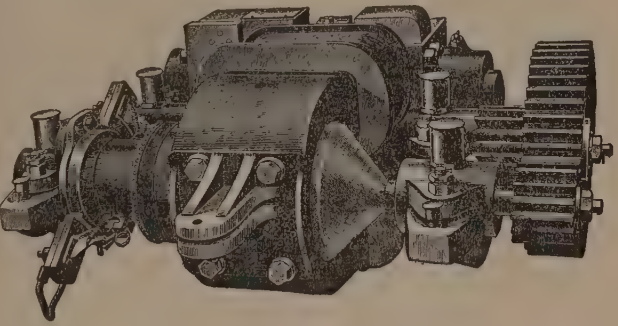


ARMATURE OF AN INDUCTION-MOTOR

Electric Railway, a railway using electric motors to move its cars. The first electric railway was a small line built by Thomas Davenport, at Springfield, Mass., in 1835. In 1851 Prof. C. G. Page ran a 16 H. P. electric locomotive at the rate of 19 miles per hour near Washington. The currents in the above cases were from primary batteries, too costly a source for commercial purposes. In 1879 Werner Siemens ran an electric railway 900 feet long at an exhibition held in Berlin; and two years later a line, 1½ miles long, was opened in a Berlin suburb. The currents were generated by dynamos. During the next few years various experiments were made with varying success. The first line which can be said to have been an engineering success was that put in at Richmond, Va., by F. J. Sprague in 1887, and most of the features that have been developed and used in our present street-systems of electric traction are found in Sprague's road. These features are one or two motors supported under the cars and geared to the axle; a switch and controller on the platform by which the speed and direction of the motor can be controlled; a single, overhead wire, suspended over the track by insulating supports, for bringing the current; a trolley-wheel carried on a pivoted pole from the car-top to connect the trolley-wire with the motor; a return-circuit through the rail and ground to the power-station. The currents are generally used at a pressure or potential of 500 volts. The current for the trolley-wire is carried by feeders, large wires, which run overhead (or underground in large cities) from the power-station, and are connected at various points with the trolley-wire. The return-currents through the ground have introduced most troublesome problems, owing to the electrolytic action on pipes for water and gas and on street-foundations. (See ELECTROLYSIS.) For means of suspension of motors from car, special trucks required, methods of control of motor-speeds, the question of lines and line-insulation and other special engineering problems that have been so successfully met, the reader must consult the technical books and journals.

The overhead trolley-wire has been replaced in some large cities by an underground conduit-system and for most elevated railroads by the third-rail system. The underground conduit-system is used in Washington, D.C., in New York city and in several European cities where the overhead wire was not considered safe, and not sightly. A small tunnel or conduit runs below the surface between the tracks, and in this is a slit for an arm which extends down from the car. The trolley-wire is carried on insulated supports in this conduit, and contact is made with it by brushes on the arm from the car above. The success of this system depends on the maintenance of insulation of the wire in the conduit, often a difficult problem owing to moisture and dirt, but successfully solved in the cities mentioned. The installation of the conduit-system is very costly, and pays only in large cities where the traffic is large. In the third-rail system an ordinary steel track-rail is carried on the insulators, supported on the wooden sleepers about a foot to one side of the track. This third rail takes the place of the trolley-wire. It has proved successful on elevated railways, as in Chicago, and is to be installed on the New York elevated railroads.

The electric railway has practically superseded horse and cable-cars for general urban and suburban purposes. It was introduced in 1887. By 1890 there were over 2,000 miles of track operated by electric traction in the United States, as against 6,000 by horses, and 500 by cable. In 1911 there were 40,089 miles operated electrically. The number of electric cars in the United States is to-day 89,601. The capital invested in this industry of only two decades is over two billions of dollars, and the net revenue for 1911 was $195,324,698. (*McGraw Electric Railway Manual, 1911.*) The power-plants of some of the electric railways are the largest known. A single dynamo for a New York plant has an output of 3,500 K. W. or about 4,600 H. P. The *Electric Railway Review* estimates that the electric cars carry nearly 20,000,000 passengers per day in the United States. The reason for this rapid increase of electric railways is due to their being cheaper and more rapid than other means of transit. In New York city the percentage of operating expenses to gross receipts for horse railways in 1900 was 73.6%, for cable 51% and for electric 40.5%, and these figures agree with those of many other cities. The electric-railway systems have extended far out into the country-districts, making those districts residences for workers in the cities. They also to-day form connecting lines between cities. One can go from Portland, Me., through Boston to New York city by using the trolley-lines connecting the intervening towns. For underground railroads the electric system has not only the advantages of economy and efficiency but that of producing no smoke. The London Metropolitan Underground road is operated by electricity, and the new underground road in New York city uses the same method. At present no long overland trunk-railroad is operated by electricity, although such schemes have been suggested for the lines between Boston, New



A STREET-CAR MOTOR

York and Philadelphia and between New York and Chicago. It is not a question of engineering but of finance, and high-speed, heavy electric roads are likely to come when the traffic will support trains at short intervals. The application of electric traction to trains of more than several cars requires a large electric locomotive or a special system of control, so that the motors on each can be controlled by one motorman. The only system in use to-day is the Sprague multiple-unit system, a most ingenious system. (See *Street Railway Journal*, May, 1901.) The alternating-current motor has been proposed for street-car work, but it requires two trolley-wires and presents serious problems in speed regulation, so that it is not in use for general railway work. The storage-battery has been proposed, and much money has been spent in trying to use it. The advantages are that each car is a complete and independent unit and that the trolley-lines and feeder-system are abolished; but every line built has failed, and the trolley-system has been substituted. Two disadvantages of the storage-battery for electric traction are the weight of the battery (two tons or more per car) and the rapid deterioration of the battery under street-car conditions. A light, durable storage-battery has been sought but not found. Edison claims to have invented such a battery. A. P. CARMAN.

Electric Welding, the process of welding two pieces of metal together by using the heat produced by an electric current. The process developed by Elihu Thomson is practically the only one used. In this the pieces to be welded are held in proper supports, and a large electric current at a very low pressure is sent through the joint from piece to piece. The passage of a large current causes a local production of heat in the metals on each side of the joint, and the metals are pressed together when at the proper temperature, a perfect weld being formed. Practically all kinds of metals can be welded in this way, and even different metals can be welded together, as copper and brass. Welds can also be made by this method in pieces whose shape would prevent welding by ordinary processes. The current used is an alternating current, often of thirty or forty thousand ampères and of correspondingly low pressure. Welding-currents are produced by a special transformer which forms part of the apparatus. The apparatus takes different forms, depending on the shape and size of the work to be handled. For joining two wires it has a very simple form, but for welding pipe or welding artillery-projectiles machines of special form are required.

Electrolysis. Volta, the inventor of the battery, showed that conductors of electricity may be easily divided into two different classes by considering their behavior while an electric current is passing through them. In one group of conductors, as iron, carbon, mercury, etc., we find that the current produces no change in the chemical composition of the body; while in the other group (which includes such bodies as solutions of table-salt, silver-nitrate, copper-sulphate, etc.) the current breaks up the salt, which is so dissolved, that at the point where the current enters the solution we get one constituent of the salt and at the point where the current leaves the solution we get the other constituent of the salt. Bodies which are not decomposed by the current, Volta called conductors of the first class; those which are broken up by the current, he called conductors of the second class. Sir Humphry Davy, in the first decade of the 19th century, established the fact that, when a current is passed through a solution, that solution is, in general, broken up into "two" other substances. It remained for Faraday, however, in 1834, to give an accurate description of the phenomena which accompany the passage of a current through a conductor of the second class. To Faraday, also, we owe the nomenclature of this subject. The wire by which the current enters the solution he called the anode; the wire by which it leaves he called the cathode; the solution itself was called the electrolyte; and the process of decomposition by an electric current was called electrolysis. The parts into which the electrolyte is decomposed are called ions. Faraday's most important discoveries are summarized in the two following laws:

I. "The amount (*i. e.* the mass) which is decomposed by an electric current is proportional to the current flowing and to the time during which it flows.

II. "When an electrolyte or a series of electrolytes is decomposed by an electric current, the components into which it is separated are always chemically equivalent *i. e.*, they are set free in just such amounts as may recombine and form a chemical compound without any left-over material."

The applications of electrolysis in commerce are very numerous. Among the most important may be mentioned: (1) plating baser metals with gold, silver or nickel; (2) electrotyping, used in all kinds of printing; (3) the separation of metals, especially copper, from their ores; (4) in defining the legal unit of current, *i. e.*, the ampère; (5) in electro-glazing; (6) in the manufacture and charging of storage-cells. Within the last few years electrolysis has found an unfortunate though important application in the destructive effects of trolley-line currents upon the water-mains in our larger cities. When the return-current leaves the iron pipe and enters the moist ground, a certain amount of the iron is dissolved.

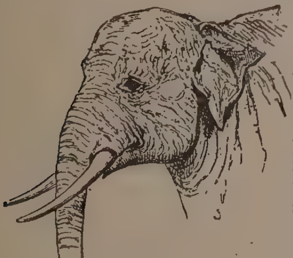
For an excellent brief account of this

entire subject, see Hastings' and Beach's *General Physics.* Read Faraday's papers, in Harper's *Scientific Memoirs.*

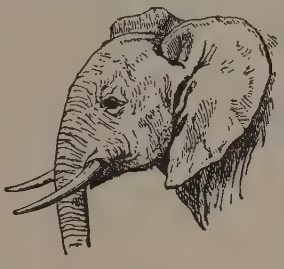
Electron. (See ATOM.)

Electrotype. The art of copying printing-type, wood-cuts, seals, medals, engraved plates etc. in metals, especially in copper, by means of a galvanic current, is called electrotyping. The process, briefly, is this: An impression of the thing to be copied is first taken in gutta-percha, sealing-wax, fusible metal or any substance which, when heated, takes a sharp impression. While this impression—say in gutta-percha —is still soft, a wire is inserted into the side of it. As gutta-percha is not a conductor of electricity, it is necessary to make the side on which the impression is taken conducting, and this is done by brushing it over with plumbago by a camel's-hair brush. The wire is next attached to the zinc-pole of a weakly charged galvanic battery, and a copper-plate is attached by a wire to the copper-pole of the cell; or the required current may be supplied by a dynamo-electric machine, as is now usual. Then the impression of the plate to be copied is dipped into a copper-solution. The copper of the solution begins to be deposited on the impression, first at the black-leaded surface near the connecting wire, then gradually over the whole conducting surface. After a day or two by the old method — in a few hours now with the new inventions in electrical machines — the impression is taken out; and the copper deposited on it, which has formed a tolerably strong plate, can be easily removed by putting the point of a knife between the impression and the edge of the plate. On the side of this plate, next the mold, we find a perfect copy of the original wood-cut. If a coin or medal is taken, we may proceed in the same way or take the medal itself and lay the copper on it. In the latter case, however, the first cast, so to speak, is negative; that is, showing depressions where the medal is raised; this negative can then be taken for a second copy, which will exactly resemble the original. See *Electro-Metallurgy*, by George Gore.

El'ephant, the largest of land-animals, with a long trunk or proboscis, with nostrils at its extremity and with two upper teeth developed into tusks. There are two kinds now living: the African elephant, inhabiting the greater part of Africa south of the Sahara, and the Indian, found in the forest-lands of India and southeastern Asia, including the islands of Ceylon and Sumatra. These are distinct kinds. The African form is slightly higher, with a convex forehead and very large ears — about three and one half feet long by two and one half feet broad. Tusks are carried both by male and female. The Indian form has smaller ears, a concave forehead and tusks only in the male. Elephants may reach a weight of three or four tons, and a height of eleven feet or a little more. The famous Jumbo was eleven feet, two inches, and at the time of his death was not done growing. The trunk is an elongated nose and upper lip grown together. The nostrils are at the end, as is also a finger-like tip for grasping. It is very muscular and strong, and is put to many uses in feeding, drinking, spraying, lifting, etc. The tusks of the African elephant are of a better quality of ivory than those of the Indian. Large tusks weigh 150 pounds and may exceed that weight, but the average weight is about 28 pounds, and they sell for about $300 a hundredweight. Elephants have been so extensively hunted and killed for their ivory, that their number is being reduced. The Indian elephant is domesticated, and is used in lumber-yards for piling lumber and other heavy work. It is ridden by native princes and their friends. A large saddle with a canopy, holding several persons, is strapped on the back, and the driver (*mahout*) sits astride the neck and uses a goad and hook in controlling the animal. Asian elephants are also put to other uses, but principally on state-occasions and in tiger-hunting. The hunters shoot from the backs of the elephants, while the natives beat up the jungle to drive the tiger into sight. Elephants live to an age of 120 years. In their native haunts they eat shoots and twigs of trees, various kinds of grass, bamboo, sugar-cane, reeds, etc. The food of the African elephant is of a coarser variety — larger shoots, roots of trees and shrubs. The elephant also is fond of fruit. In captivity it is fed largely on hay and carrots. It has a long memory for friends and foes, revenging itself for tricks and insults. Asian elephants were used in war by ancient warriors. Egypt and Carthage domesticated the African elephant, and Hannibal used it in his wars. For extinct species of the elephant, see MAMMOTH and MASTODON. See Halder: *The Ivory King.*



HEAD OF INDIAN ELEPHANT



HEAD OF AFRICAN ELEPHANT

Eleusis (*ē-lū′sĭs*), next to Athens the most important city of ancient Attica. It was situated on the Bay of Eleusis, opposite Salamis, and was connected with Athens by the Sacred Road. It was famous as the chief seat of the worship of Ceres (Demeter), whose mystic rites — the Eleusinian mysteries — were here performed with great pomp and solemnity from the earliest times (B. C. 1356?) till Alaric, the leader of the Goths, destroyed the famous temple of the goddess in 396 A. D. The site of the old city is now occupied by the little village of Leusina. Excavations since 1882 have revealed many remarkable ruins.

El′eva′tor, a machine for carrying passengers and freight from story to story in buildings. It consists of a car more or less open, which is raised and lowered in a suitable shaft in the building. Elevators may be moved by hand or by mechanical power. The power used is hydraulic, steam or electric power. In hydraulic elevators the power is due to the water-pressure acting on a piston working in a cylinder. Hydraulic elevators are of the ram or the suspended type. In the ram-type the car or platform is carried on a vertical rod that is attached directly to the piston of the water-cylinder. The length of the cylinder is thus the same as that of the extreme height to which the elevator rises. Such elevators are used in Europe. They are safe, but very slow, and not adapted to great heights. In the suspended type of hydraulic elevator the piston only works through a short distance, but this motion is multiplied by an inverted block-and-tackle which raises the elevator. In steam and electric elevators the wire-rope which raises the elevator-car is wound about a drum, which is revolved by the steam-engine or the electric motor. The elevator is controlled from the car by ropes or rods which act on the valves of the hydraulic cylinder or on the starting and stopping devices of the engine or motor. Various safety-devices are used to prevent a fall of the elevator-car in case of the breaking of the rope, and accidents seldom take place. Elevators are an absolute essential to the modern tall building in the city. The speed used in elevators is several hundred feet per minute, and they can be used for any height. The elevator in the Washington monument runs 500 feet. This is one of the highest elevators in the world.

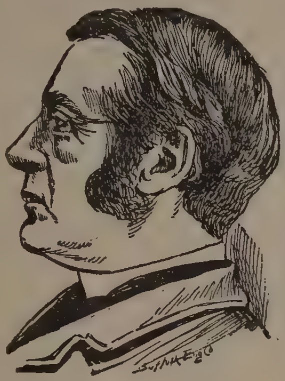
Elgar, Edward William, a prominent English composer, was born at Broadheath, near Worcester, on June 2, 1857. His *Dream of Gerontius* brought him great fame in 1900. This has been maintained by the large works that have followed: *The Apostles* and *The Kingdom.* The list of his orchestral and smaller compositions is considerable, and has aided in placing him in the first rank of contemporary composers.

Elgin (*el′jĭn*), a city in Kane County northwestern Illinois, on Fox River, 36 miles northwest of Chicago. It has a large dairy-business, with extensive milk-condensing factories, supplying Chicago with butter and other dairy-products. It has large manufactories of carriages, shoes, farming-implements and washing-machines. Its other industries include meat-packing establishments, cotton-mills, soap-factories, etc. It is best known, however, as the seat of the watch-works, which employ 3,000 workmen and produce 1,800 watches daily. It was one of the first watch-factories in the United States, and the Elgin with other American watches has largely taken the place of foreign watches in the trade. The Northern Illinois Hospital for the Insane is at Elgin. There are also a Catholic seminary, a school of manual training, excellent public schools, many handsome churches and a public library. Population, 25,976.

Elgin Marbles, a celebrated collection of ancient sculpture brought from Greece (1801-03) by the Earl of Elgin, then English ambassador to Turkey. The British Museum obtained them from him in 1816 for about $175,000. The sculptures adorned certain buildings on the Acropolis of Athens, which then was a Turkish fortress. The chief portions, which are from the Parthenon or Temple of Minerva, were designed by the great sculptor Pheidias. At the time of their removal a fierce controversy arose in England as to Lord Elgin's right to take them from Athens. Lord Byron considered their removal very unjust, and his view was shared by many. See Newton's *Contents of the British Museum, Elgin Room.*

Elia. See LAMB, CHARLES.

Elias or **Eli′jah,** the greatest of the prophets of Israel, flourished about 900 B. C. The Bible tells how God, through him, imposed a three years' drouth upon the northern kingdom; how he was fed by ravens; how he challenged the pagan priests at Mt. Carmel to bring down fire from heaven to consume their sacrifice; and how he was later taken up to heaven in a chariot of fire. He was an uncompromising upholder of the Hebrew faith against idolatry, especially against the Baal-worship brought from Phœnicia by Jezebel, and saved the purer religion from destruction and corruption. Like Moses and Samuel, he was statesman as well as prophet, ordaining new kings for Israel and Syria and appointing Elisha his prophetic successor. The Jews of later times expected Elijah to return to announce the coming of the Messiah, and the prediction of his return is declared in the New Testament to have been fulfilled in John the Baptist. Elijah also appears with Moses on the Mount of Transfiguration. His story is a favorite with artists. See *Kings I* and *II* and *Elijah* by Dr. Milligan.



CHARLES W. ELIOT

Eliot, Charles William, LL.D. president of Harvard University, was born at Boston, Mass., March 20, 1834, and educated at Harvard. He began his educational career as tutor in mathematics in his *alma mater* and later became professor of chemistry at Harvard and at the Massachusetts Institute of Technology. In 1869 he was chosen president of Harvard, where his influence on educational thought has been great. He resigned in 1908, to take effect in 1909. In conjunction with F. H. Storer he published *Manuals of Qualitative Chemical Analysis* and *Inorganic Chemistry*. He has also published *Educational Reform* and *Five American Contributions to Civilization*

GEORGE ELIOT

Eliot, George, the name by which the great English novelist, Marian Evans, is known. She was born in Warwickshire, Nov. 22, 1819. Her father was a man of strong character, and after her mother's death in 1836 Marian took charge of the house. She was well-educated, and was a wide reader. When she was just of age, her father removed to Faleshill Road on the outskirts of Coventry. Here she became acquainted with Charles Bray, the author of several works in philosophy, and formed a close friendship with his wife and her sister and brother, Sarah and Charles Hennell. Through their influence she began to give up her early belief in Christianity. In 1846 she published a translation of the German writer Strauss' *Life of Jesus*, and she later translated other philosophical works. In 1850 she began to write for the *Edinburgh Review*, and next year became its assistant-editor. Her first stories, *Scenes from Clerical Life*, appeared in *Blackwoods' Magazine* in 1857, and at once gave her a wide reputation. Two years later she published *Adam Bede*, which fixed her place among the greatest English novelists. This was followed by *The Mill on the Floss, Silas Marner, Romola, Felix Holt, Middlemarch* and *Daniel Deronda*. Of her poetry, *The Spanish Gypsy* and *The Legend of Jubal* are well-known, though they do not rank with her prose-works. As a novelist George Eliot is specially noted for power in describing the growth of character. Her subjects are all representatives of distinct traits of character. Her first husband, the author G. H. Lewes (q.v.), died in 1878. She married John Cross in 1880, but died December 22nd of the same year. See *Life of George Eliot* by J. W. Cross and R. H. Hutton's *Modern Guides of English Thought.*

Eliot, John, "the Apostle to the Indians," was born in Hertfordshire, England, in 1604, the son of a yeoman; graduated at Cambridge in 1622; and went to Boston in 1631. In 1646, after two years' study of the Algonquin language, the tongue of the Indians of Massachusetts, he preached a long sermon to the Indians near Roxbury, and other meetings followed. At one time there were over a dozen townships of "praying Indians" in Massachusetts, and many more outside, numbering 3,600. Eliot, with two others, prepared the *Bay Psalm Book*, which appeared in 1640, and was the first book printed in America north of Mexico. He made several translations of English religious books into the Indian tongue, but his greatest work was his Indian Bible. He died at Roxbury, Mass., on May 21, 1690. See *Life* by C. Francis in Sparks' *American Biography.*

Eliot, Sir John, English statesman was born at Port Eliot, England, on April 20, 1592, the son of a country gentleman of Cornwall. While traveling in Europe he met Villiers, afterward Duke of Buckingham. As an adherent of the duke he entered Parliament in 1624. But in the next parliament he broke with him, owing to the refusal of Buckingham—at that time the favorite adviser of King Charles I — to acknowledge the house of commons as the real ruling power in the nation. Eliot became the leader of Parliament against the encroachments of the king on its rights, and this policy at last brought about the impeachment of Buckingham. For this Eliot was imprisoned in the Tower for nine days. In the Parliament of 1628 his voice was raised against taxation by the crown without consulting Parliament, and it was mainly through him that the famous *Petition of Right* was extorted from Charles. He was sent to the Tower in 1629, and died there on Nov. 27, 1632. See *Life* by John Forster.

Eli'sha, a prophet of Israel, the successor of Elijah. He prophesied for 55 years.

Receiving the mantle of his master when he was taken up into heaven, he was recognized by the other prophets as their head, and was held in reverence throughout his whole life by the Israelites. His history is told in the second book of *Kings*.

Eliz'abeth, county-seat of Union County and formerly the capital of New Jersey, is situated five miles from Newark. Its trade has access to the sea through Elizabethport, on Staten Island Sound. It is the seat of a large Singer sewing-machine factory, and also has manufactories of oilcloth, mill-machinery, stoves, harness, pottery, ironware, hats, combs, etc. Elizabethport ships large quantities of coal, and here are located the shops of the Central Railroad and the Crescent Steel Works and Shipyard. The city has a business-college, two high-schools and 11 grade-schools. A drawbridge over the sound, 800 feet long, joins New Jersey with Staten Island. Population, 73,409.

Elizabeth, queen of England, was the daughter of Henry VIII and Anne Boleyn, his second wife, and was born in Greenwich Palace Sept. 7, 1533. Her mother was beheaded when she was not yet three years old, and her father married Jane Seymour. Her early years were passed mainly with her governess and teachers, among them Roger Ascham and Sir John Cheke, under whom she learned to read Latin and Greek, to speak French and German with ease and to acquire what little music was then known. Two of her stepmothers, Anne of Cleves and Catherine Parr, were quite friendly to her, and Catherine would have had her much at court had it not been for Henry's dislike to his daughter. But till the death of her sister Mary, when she herself became queen, she had little to do with court or politics. Some of Elizabeth's teachers had been Protestants, and, as she was known to be such herself, Queen Mary suspected her of being concerned in Wyatt's rebellion in 1554, and she was thrown into the Tower. Afterward she was kept strictly guarded in Woodstock, and her worshiping with the Catholics was probably all that saved her from being sent to the block. On the death of Mary on Nov. 17, 1558, Elizabeth, then 25 years old, was summoned to the throne amid the rejoicings of the Protestants and many moderate Catholics. She at once saw that her part in European politics must be that of a Protestant sovereign. The great blots upon her reign are the persecution of the Catholics and the beheading of Mary, Queen of Scots. There is no doubt that Elizabeth was very jealous of Mary's beauty and attractiveness, though she was also prompted to the act by the discovery of designs against her life, such as the Ridolfi plot. The glory of Elizabeth's reign, on the other hand, is the destruction of the Spanish Armada in 1588. When an army gathered at Tilbury for the defense of England, she showed the courage of her race and made a ringing and patriotic speech to her troops, but the real credit for saving the nation is not hers. She was the last to believe that the Armada was really coming, and was so penurious in fitting out and provisioning the navy that she risked defeat and prevented the victory which was won from being as complete as it otherwise would have been. The real credit is due to the skill and courage of the great English captains of the time and to the generous gifts of English merchants. Elizabeth, however, showed both sense and shrewdness in her choice of the ablest men of the kingdom as her ministers. "The golden days of good Queen Bess" form one of the greatest periods of English history — the period when Great Britain became a world-power.

Elizabeth never married, but it was not for want of suitors. Philip of Spain, who had married Mary; Eric, king of Sweden; Henry III of France; Henry of Navarre; and Archduke Charles of Austria were some of her professed admirers. It is curious that more than any of these kingly suitors she liked the duke of Alençon; although, when they first met, she was 38 and he was 19 and a dwarf, with a face horribly disfigured by smallpox. But her heart was most deeply touched by Robert Dudley, Earl of Leicester, master of the horse, handsome and clever, husband of ill-fated Amy Robsart. The next favorite was the equally ill-fated Earl of Essex. But Elizabeth alternately loved and scolded him, seeming to care for him more as a mother cares for a spoiled child. When Essex was beheaded for rebellion, in 1601, she does not seem to have shown much grief. Elizabeth's love of dress is notorious. A German traveler who saw her going to chapel when she was in her sixty-fifth year, says: "She had pearls with rich drops in her ears, wore false red hair, had a small crown on her head, her dress white silk bordered with pearls the size of beans, a collar of gold and jewels." When young, she was noted for her abundance of auburn hair and delicate white hands, but her face and manners were almost masculine Elizabeth died on March 24, 1603. See *Queens of England* by Strickland; Creighton: *Queen Elizabeth;* and Hassall: *The Tudor Dynasty.*

Elizabeth, Pauline Ottilie Luise, queen of Rumania, was born at Neuwied on the Rhine, Dec. 29, 1843. As a writer she is best known by her pen-name, Carmen Sylva, under which she published *Sappho, Storms, Pilgrim Sorrow, Some One Knocks, Hammerstein, Jehovah,* etc. In 1869 she married Prince Charles (King

Carol I) of Rumania, and with her marriage she began to take an enthusiastic interest in Rumania, especially when its independence of Turkey was proclaimed, and it was erected in 1879 into a kingdom. In 1881 she and her consort came to the throne, and in that year she published *Pensées d'une Reine*, and some years later she issued a collection of her lyric poems. In her kingdom she is deemed the mother of her people.

Elizabeth, Saint, daughter of Andreas II, king of Hungary, was born at Presburg in 1207. When four years old, she was promished in marriage to Louis IV, landgraf of Thuringia, and was brought to his court in the Wartburg, to be raised under the eyes of her future husband's parents. She early became passionately devoted to the Christian life. She despised pomp, and tried to be humble, and was most self-denying in her gifts to the poor. The marriage took place when she was but 14, and six years later Louis died as a crusader, while at Otranto. Great misfortunes soon befell the saintly landgravine. She was deprived of her regency by her husband's brother, and driven out of her kingdom on the ground that she wasted the state-treasures by her charities. At last she found refuge in a church, where her first care was to thank God that He had found her worthy to suffer. After other trials, such as being forced to take up her abode in the stable of an inn, she was received into a monastery by the abbess, who was her aunt. When the warriors who had gone with her husband on the crusade came back from the east, she gathered them around her and recounted her sufferings. Steps were at once taken to give her back her rights, but she refused again to be regent and would only take the revenues that belonged to her as landgravine. She was allowed to go back to her castle at Marburg, but in her humility she lived in a cottage at the foot of the hill on which it stood, donning the nun's dress and spending all her life and all that she had in relief of the poor, earning with her own hands what little she needed for herself. She died on Nov. 19, 1231, and four years later was added to the number of the saints by Pope Gregory I. For ages her shrine was one of the most famous in Europe, and the altar-steps before it are worn hollow by the knees of pilgrims. Even during her life many miracles were connected with her name. The best-known story is that of the basket of roses. Against her husband's command she carried a basket of food to a poor family. On the way she met her husband, who sternly ordered the basket to be opened. Frightened and trembling, she obeyed, only to find in answer to her prayer the basket filled with beautiful roses. See Kingsley's *Saints' Tragedy*.

HEAD OF ELK

Elk or **Moose,** the largest living deer common to the Old and New World in northern regions. In the New World it is found mostly in northern Maine and British North America. It has long legs, standing about six feet high, a large head with broad muzzle and large nostrils, but can be distinguished from all other deer by the horns or antlers of the male, each of which is in two parts, like a broad hand with the palm curved and held upward; around the margins are prongs or snags. An average full-grown pair, with the skull, weighs 70 pounds. They grow gradually; the first year being only knobs an inch high, the second year they are about a foot long, and the third year are palm-shaped. The fully formed horns are shed in December, and sprout again in April, reaching their full size in June. It is remarkable to think of these enormous horns being shed annually and produced again in so short a time. The moose feeds on willow-tips, the tender shoots of the striped maple and other trees, bark and various evergreens Moose are rapid runners, and, having sharp senses of hearing and smell, are difficult to hunt. In winter they herd in small troops for protection. Remains of an extinct elk of gigantic size are found in the peat-bogs of Ireland. This Irish elk held its antlers ten feet high, and they measured 11 or 12 feet from tip to tip. In America the wapiti is often wrongly called the American elk. See Edward's *Campfires of a Naturalist*.

Elkhart, Ind., a city of central northern Indiana, capital of Elkhart County, 20 miles east of South Bend and 100 east of Chicago. It lies at the confluence of the St. Joseph and Elkhart Rivers, and is the junction of a number of railroads. These advantages make it a good shipping-point and attractive manufacturing city. The town was founded early in the thirties, and incorporated in 1875. Here are located the locomotive-shops of the Lake Shore Railroad, foundries, planing-mills and factories. Among its manufactories are paper-mills, carriage and musical-instrument establishments, the largest band-instrument factory in the world being here. The city has 30 churches and ten schools, and is a modern, progressive, business city. Population, 19,282.

Elkins, Stephen Benton, American politician, was born in Perry County, Ohio, Sept. 26, 1841, and was educated in Missouri, where he began the practice of law. In 1863 he settled for a time in New Mexico and became member of the territorial legislature, attorney-general, United States district-attorney and delegate in Congress from New Mexico. He subsequently removed to West Virginia and became interested in railroads and in coal-mining. He was appointed secretary of war in the Republican administration of President Harrison, and later became United States senator from his state of West Virginia.

Ellice (*ĕl'lĭs*) or **Lagoon Islands, The,** were discovered by Capt. Peyster, an American, in 1819. They lie north of Fiji. The principal islets include Sophia (Rocky) Island and the Nukulaelae (Mitchell) group. The entire group has a population of 2.400 on 14 square miles of land. It is under the jurisdiction of the high-commissioner for the western Pacific, whose headquarters are in Fiji.

WHITE ELM

Elm (genus *Ulmus*), an important tree of temperate climes. The English elm is one of the chief timber-trees of the British Isles and is highly valued for its beauty. Comparing it with the American elm, it is a stockier tree and of less grace. The American or white elm is a tree dear to all familiar with New England, and is famous in our history. Every schoolboy has read of the Washington elm at Cambridge, Massachusetts, under which Washington stood when he took command of the American army, and of the elm under which William Penn made treaty with the Indians. It is a magnificent tree, sometimes towering 125 feet, its height and its great, arching limbs presenting a most stately and graceful appearance. In New England the long arms reach quite across the wide roadway. The New England elms veritably are a race of giants. The bark is gray and rough; the leaves, from two to six inches long, are alternate, obovate, and make pleasant but not too heavy foliage; the flowers, inconspicuous and greenish red, appear in March; the fruit is small, winged, green seeds. The tree is of rapid growth, its distribution being from Newfoundland to Florida and west to the Rocky Mountains. A great pity is the troop of insect-destroyers that are doing their best to lower the pride of the stately tree; the tussock-moth, elm-beetle and brown-tail greatly marring its beauty.

The slippery elm is a tree beloved of the "chewer," who, by the way, works it much harm in his effort to get at the fragrant inner bark, the cambium that in the spring is so inviting and refreshing. Druggist as well as small boy appreciates its virtues, keeping on his shelf various preparations made therefrom. The slippery elm, moose or red elm, is a quick-growing tree, rises 60 to 70 feet, and has a broad, flat head and spreading branches; the bark is rough and reddish-brown; the leaves are alternate, broadly oval, and from four to seven inches long. The tree grows fast and vigorously when not too ruthlessly attacked, but is becoming scarce.

The rock, cork or hickory elm has the typical elm-leaf but not the characteristic grace of the family. It has a corky bark, bears flowers and fruit in racemes; grows from 60 to 90 feet high, and has a round-topped head and stiff branches. The wood is hard and highly valued by the wheelwright. This elm thrives in lower Ontario and Michigan, and is found in scattered localities from Vermont to Tennessee and west to Nebraska. See Rogers: *The Tree Book;* Lounsberry: *A Guide to the Trees.*

Ellora, a village of Hindustan, celebrated for its wonderful rock-hewn temples. Of these there are 34 of a large size. Some are cave-temples proper, that is, chambers cut out inside of the rock; but others are buildings hewn out of the solid granite of the hills, having an outside as well as an inside architecture. In cutting the latter, a deep trench or pit is dug around a square, leaving a central mass standing, which is then hewn and excavated into a temple. The Hindu temple called the *Kailas*, is the most beautiful of all. It forms a pyramid, and is overlaid with sculpture. It is believed that the caves date from the seventh century.

Elmi'ra, New York, the county-seat of Chemung County, is on Chemung River, 149 miles from Buffalo. It has manufactories of iron-rails, railroad-cars, carriages, flour, leather, woolens, boots and shoes, steel-plate works, glass-works, rolling-mills, steel-bridge works, hard-wood finishing-works, etc. The city is in a fertile region, and there are stone-quarries in its vicinity. Here are located Elmira College, a state-armory, Arnot-Ogden Memorial Hospital, Steele Memorial Free Library, a government-building and various charitable institutions. Elmira has a fine park-system and all the adjuncts of the modern city. Population, 37,176.

El Paso, Texas, the county-seat of El Paso County and the northwestern gateway into Mexico, is situated on the Rio Grande River, on the southern boundary of New Mexico. Five of the great lines of railway-travel center here, but connect with the Pacific coast and the Mexican capital. The city has a high elevation and a mean annual temperature of 63° F. Near by are extensive salt-deposits as well as minerals. The United States government maintains a military post here. The population, which is a mixed one, including a number of Mexicans, Indian half-breeds, etc., numbers 39,279.

Elves. See FAIRIES.

Elwood, Ind., a rapidly growing town in Madison County, central Indiana, 40 miles northeast of Indianapolis, is on the Lake Erie and Western and other railroads. It is a shipping point for grain and live-stock, and has a rapidly developing trade. Its manufacturing industries include saw and stave-mills, flax-factories and establishments for the manufacture of window, plate-glass and lamp-chimneys, flour and tin-plate mills, etc. It is surrounded by an agricultural region, and is in a natural-gas belt. The population within the past 20 years has risen from 2,284 to 11,028.

Ely, a town in Cambridgeshire, England. Here, in 673, Saint Etheldreda founded a mixed monastery, which, burned in 870 by the Danes, was refounded in 970 as a Benedictine abbey. In 1083 the first Norman abbot laid the foundation of the present church, which was made a cathedral in 1109, and, as we see it to-day, is one of the finest shrines in Christendom. Built in the form of a cross, it offers examples of all styles of Gothic architecture and is a growth of more than four centuries. Population of Ely, 9,000.

Ely, Richard Theodore, an American professor of political economy, was born in April, 1854, and studied at Columbia University and at Heidelberg. He was professor at Johns Hopkins from 1881, and at Wisconsin from 1892. Professor Ely believes in public ownership of such utilities as the telegraph and railway systems. While not a socialist, he is friendly to labor, and was even accused in 1894 of aiding a strike, but was acquitted. He is the author of several books, the latest and largest being his *Distribution of Wealth.* Others are *French and German Socialism in Modern Times*, *Socialism and Social Reform* and *Social Aspects of Christianity.*

Elyria, Ohio, a county-seat of Lorain County, 25 miles from Cleveland. The surrounding country is agricultural, but in the vicinity there are sandstone-quarries, which provide employment for many people. Among the industries are the manufacture of iron and steel-products, automobile-supplies, saddles, bicycles, etc. Population, 14,825.

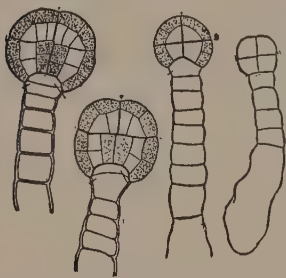
Eman'cipa'tion Proclamation. After the Civil War had been in progress for more than a year, the antislavery leaders in the north urged President Lincoln to take action toward the abolition of slavery. While personally opposed to slavery, the president was slow to take so important a step until it should appear to be necessary in order to save the Union. Replying to the suggestions, he said, on Aug. 22, 1862: "My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing any slave, I would do it; if I could save it by freeing all the slaves, I would do it; and if I could save it by freeing some and leaving others alone, I would do that." At length it became evident that slavery was a source of military strength to the Confederate cause, since slave-labor provided the means of supporting the Confederate forces in the field, and that it must be destroyed if the Union was to live. Accordingly, on Sept. 22, 1862, the president issued a preliminary proclamation, giving notice that on the 1st of January, 1863, "all persons held as slaves in any state, the people whereof shall then be in rebellion against the United States, shall be then, thenceforward and forever free." No attention was paid to this notification, and on the first day of January, 1863, President Lincoln issued the final proclamation of emancipation, declaring free all persons held as slaves in the states then in rebellion. This proclamation was given effect as fast as territory came under Federal control.

Eman'uel I, king of Portugal, called the Great or the Fortunate, was born on May 3, 1469, and became king in 1495. His reign is known as the golden age of Portugal. He prepared the code of laws which bears his name, and made his court a center of chivalry, art and science. Vasco da Gama's voyage round the Cape of Good Hope, Cabral's discovery of Brazil and the expeditions of Albuquerque and others, that so widened Portuguese possessions, were all sent out and encouraged by Emanuel. It was he that made Portugal the first naval power of the world as well as its great commercial center. He died at Lisbon on Dec. 13, 1521.

Embalming. See MUMMY.

Embar'go-Acts are orders to restrain the ships either of a foreign nation with whom war has been declared or of the home nation from leaving port. An embargo-act was passed in the United States in 1794. This act was the answer to the British orders-in-council of 1793. France and England had each tried to cripple the other by declaring in turn that neutral vessels carrying to either were the lawful prize of the other. The United States had too weak a fleet to declare war, and, therefore, tried to bring the two powers to terms by preventing her own vessels from trade. The southern party, chiefly agricultural, was in power, and their action crippled New England, which was so hard hit by its loss of trade that it threatened to secede. A stricter embargo-act was passed in 1807. Exports fell from \$110,084,207 in 1807 to \$22,430,960 in 1808. The American carrying-trade has never since fully recovered. England, the chief offender in seizing American ships and pressing American sailors (for France did not command the sea), alone profited by the American embargoes. In 1809 the embargo was removed, but in its stead a non-intercourse act was passed against trade with France or England. War broke out with England in 1812. A new embargo was levied until 1814. In spite of the opinion of Jefferson, it seems clear that the embargoes injured the home country more than her enemies, and thus were unsound.

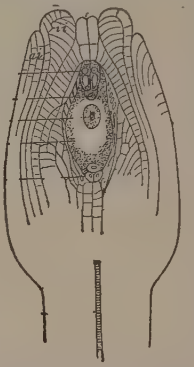
Em′bryo (in plants), a plant in the earliest stages of its development. In *Spermatophytes* the name is restricted to the development within the seed. Taking the bean embryo as an illustration, it consists of a small stem, once called the caulicle, but now known as the hypocotyl; from the lower end of which the root develops, and at the upper end two large and fleshy leaves appear (the halves of the bean), called the cotyledons. Between the cotyledons a little bud is apparent, called the plumule, in which the subsequent leaves are more or less formed, and which is to develop into the shoot when the embryo escapes from the seed. Such an embryo represents the common form among the dicotyledons. Among the monocotyledons, as in corn, the same parts appear, but the single large cotyledon is terminal on the hypocotyl, and the stem tip comes out at one side. Among the conifers, as in pines, a rosette of cotyledons may appear, in the center of which is the plumule. In the development of the embryos of seed-plants a temporary organ, called the suspensor, usually appears. It generally is a more or less elongated filament of cells, which at its tip bears the cell which is to form the real embryo, and by its growth places this cell in a better position in reference to the food-supply which is forming in the seed. JOHN M. COULTER.



Embryo of capsella, showing superior (below) and embryo (above) in various stages of development

Embryology. See DEVELOPMENT.

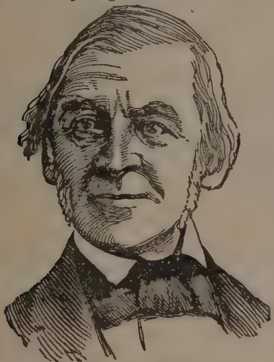
Em′bryo-Sac (in plants). In the ovule of angiosperms there is developed what appears to be a large cavity, but is really a single large spore which is not discharged (see MEGASPORE). This spore germinates and develops within itself a very simple gametophyte consisting of seven cells (see GAMETOPHYTE). This spore containing its gametophyte, before it was known to be a spore, was called the embryo-sac, because the embryo was observed to develop within it. At one end of the sac three of the seven cells are grouped together, the group being called the egg-apparatus, since the central cell is the egg, which is to produce the embryo, and the other two aid it in the process of fertilization. At the opposite end of the sac is another group of three cells known as the antipodal cells. Usually they disappear very soon after they are formed. In the central region of the sac a very large cell appears, called the definitive nucleus or endosperm nucleus. It is this cell which produces the endosperm or food-cells for the use of the embryo. In many seeds, as corn and wheat, it is the endosperm which supplies the food-material used by man



SECTION OF OVULE

Emerald, a mineral differing in nothing but color from beryl. The emerald is highly esteemed as a gem. It owes its value mainly to its very beautiful velvety-green color. It is found in very few places. The finest have long been brought from Colombia, where they are got from veins in slate and granite. Valuable stones also come from the upper Orinoco in Venezuela. Poor stones are found in Europe, in Salzburg and the Ural Mountains, and some old mines in Egypt yield them. The gem was known and highly prized in early times. Ptolemy offered a famous poet, who visited his court, an emerald set in gold, with his portrait engraved on it. Nero, who was near-sighted, looked at the combats of gladiators through an eyeglass of emerald. An emerald is rarely without a flaw, and its value depends on its color. A very perfect emerald of six carats has been sold for \$5,000. The name of oriental emerald is often given to a very rare, beautiful and precious green sapphire.

Emer′gence (in plants), outgrowths from the surface of a plant, such as warts, prickles, etc., which involve in their origin the cortex as well as the epidermis. For example, the stem prickles of the rose are emergences. A contrasting term is trichome, which is applied to structures derived entirely from the epidermis, as ordinary hairs.



RALPH W. EMERSON

Em′erson, Ralph Waldo, a great American essayist, was born at Boston, on May 25, 1803, and graduated at Harvard College in 1821. He studied theology under the direction of Channing, and became pastor of the Second Unitarian Church of Boston. A difference of religious views between Emerson and his congregation brought about a friendly separation, and the remainder of his life was spent as a lecturer and writer. In 1833 he made a first visit to Europe, of which he has given an account in his *English Traits.* The next year he moved to Concord, and lived first in the house afterward occupied by Hawthorne and celebrated in one of his stories as the Old Manse. It was also in this year (1834) that he began to correspond with Carlyle, whom he had sought out and talked with when in England. This correspondence, lasting from 1834 to 1872, has been published, and shows the two men with all their differences, yet with many deep sympathies. In 1836 appeared *Nature,* a poetical rhapsody in prose, and though much admired by a small circle of readers, it took twelve years to sell 500 copies. But his oration on *The American Scholar,* delivered at Harvard, attracted the widest attention, as did also his oration delivered at Harvard Divinity School in 1838. Of these writings Oliver Wendell Holmes remarks: "Whosoever has read carefully and lovingly these three essays, *Nature, The American Scholar* and the *Divinity School Address,* can almost say of Emerson what he makes the sphinx say of herself:

> Who telleth me of my meanings
> Is master of all I am.

Representative Men, The Conduct of Life and *Society and Solitude* are others of his best known books. Emerson died at Concord, Mass., April 27, 1882. Matthew Arnold declared that if Emerson had only had the power of sustaining himself at the sublime heights he sometimes reached, he would have ranked among the world's great poets. He is the friend of all who would live in the spirit. See *Ralph Waldo Emerson,* by Holmes, in the series of the American Men of Letters.

Em′ery, a mineral belonging to the same class as ruby, sapphire and other precious stones. In outward appearance emery has nothing in common with the precious stones to which it is related. It is a dense, opaque, dull, bluish-black substance, like a fine-grained iron-ore. It is found in large, bowlder-like masses on Naxos and some of the other islands of the Grecian archipelago. It is made ready for use by first breaking it into lumps about the size of a hen's egg, then crushing these to powder by stampers. It is then sifted to various degrees of fineness. Emery-powder, as it is next in hardness to diamond-dust and crystalline corundum, is used for cutting and polishing many kinds of stone. Glass stoppers of all kinds are ground into their fittings with it. Plate-glass is ground flat by its means. When used for polishing metals, it has to be spread on some kind of surface to form a fine file. Emery-paper, emery-cloth, emery-sticks, emery-cake and emery-stone are used for this purpose. Emery-wheels are largely used for polishing iron-castings. They are a mixture of emery-powder and hard, vulcanized india-rubber.

Emigra′tion means going out of one country into another, and generally to a far-away part of the world. In the country which people leave they are generally called emigrants or wanderers out; in that in which they settle they are usually styled immigrants. Jacob and his family were immigrants into Egypt, and their descendants became emigrants from that country when they went to inherit the promised land. Among the main causes which have led to emigration at different times are the pursuit of wealth, the pressure of over-population at home and discontent, political, social or religious. The Spaniards came to America to get gold. Many of the Greeks in old times emigrated because of over-population. Political and social discontent accounts in great measure for the large numbers of Irish emigrants. Forced service in the army is one great cause of German emigration. Religious persecution led to the emigration of the Huguenots from France to England and of the Puritans from England to North America. At the end of the 15th century the opening of the passage to India round the Cape of Good Hope by Vasco da Gama and the discovery of America by Columbus at once brought to the eyes of Europeans new lands, and then modern emigration began. The Spaniards left their motherland to go to the West Indies and to Central and South America; the Portuguese to Brazil, the East Indies, India and Ceylon; the Dutch to the East and West Indies, Guiana, New York and the Cape of Good Hope; the French to Mauritius and Bourbon, the West Indies, Louisiana, India and Canada; the English to the West Indies, North America and, later, to India, Australia and

South Africa. European emigration has been greatest in the 19th century, because the population has increased so enormously. Europeans are naturally attracted to countries of like climate, which have not already an over-large population and in which the chances of gaining wealth are good. For these reasons the greatest emigration has been to the United States, Australia, South Africa and the temperate parts of South America, for example, the Argentine Republic.

Emin Pasha or **Bey,** proper name **Eduard Schnitzer,** was born at Oppeln, Silesia, in 1840. He studied medicine, and in 1864 went to Turkey, where he became a well-known physician. He learned to speak Turkish and Arabic easily, and adopted Turkish habits and customs. He also adopted the name Emin, which means the faithful one. In 1876 he joined the Egyptian service, and proceeded as chief physician to the equatorial province, of which he was made governor in 1878 by "Chinese" Gordon. Here the sudden rising of the Mahdi shut him up and out of the world. The expedition sent under Stanley for his rescue reached him in May, 1888. In 1890 he entered the German service and at once made his way again to Central Africa. He was, however, killed in 1892 by Arabs near Nyangwe. See Stanley's *In Darkest Africa.*

Em'met, Robert, an ill-fated Irish patriot, was born at Dublin in 1778. At fifteen he entered Trinity College, where Moore, the poet, was his fellow-student, but soon left to join the United Irishmen. He next traveled in Europe, talked with Napoleon and Talleyrand in 1802 on behalf of the Irish cause, and came back the next year to expend $15,000 of his own fortune for muskets and pikes. With a small band he designed a plot to seize Dublin Castle and make a prisoner of the viceroy. The rising utterly failed, and Emmet, who had clothed himself for the occasion in a green coat, white breeches and cocked hat, saw nothing result from the enterprise but a few ruffianly murders. He escaped, but coming back for a last leave-taking from his sweetheart, Sarah Curran, the daughter of the great Irish orator, he was arrested, put on trial Sept. 20, 1803, condemned to death, and hanged on the following day. Just before receiving sentence he made a speech which still thrills the reader by its noble and pathetic eloquence. See Madden's *Lives of the United Irishmen.*

Empo'ria, county-seat of Lyon County, Kan., on Neosho River, 60 miles southwest of Topeka. It is the trade-center of the surrounding section, which is engaged in farming, dairying and fattening cattle for the eastern market. The city has carriage and canning-factories, flour and grist-mills, woolen mills and iron and marble-works. Emporia has several fine churches, good schools and school-buildings, a business college and railroad and public libraries. Besides, there are the State Normal School, the College of Emporia (Pres.) and the Western Conservatory of Music. The town was founded in 1856 and incorporated in 1870. Population, 9,058.

Ems or **Bad=Ems,** a bathing resort known to the Romans and famous in Germany as early as the 14th century. It is on the River Lahn, ten miles from Coblenz. Its warm mineral springs contain soda. The temperature of the different springs varies from 80° to 135° F. Population, about 7,500.

Emu, a running bird of Australia, closely related to the cassowary. The emu lives on the plains, the cassowary only in the forest and dense scrub. The emus have no cap or helmet like the cassowaries. The head and neck are not bare as in the cassowaries, but are provided with feathers. The plumage is heavy and dull-brown in color. The wing-rudiments are very small. The bird stands about five feet high. Its food is exclusively vegetable, consisting of fruits, roots and herbage. It may be tamed, and breeds easily in captivity. It lays six or seven dark-green eggs, nearly as large as ostrich-eggs, in a cavity scooped in the earth, usually in sandy soil.

EMU

Ency'clopæ'dia, meaning general instruction, is a work professing to give information in regard to the whole circle of human knowledge or in regard to everything in some division of it. The older encyclopædias attempted to give everything then known on all subjects; but, as knowledge has increased, it has become more and more necessary, in order to say something about everything, to be content not to say everything about anything. The great Latin collections of Terentius Varro, dating from 30 B. C., and the *Natural History* of Pliny the Elder are the first works which can in any sense be called encyclopædias. In the 10th century the Arabian, Farabi, wrote an encyclopædia remarkable for the time. Vincent of Beauvais, under the patronage of Louis IX of France, gathered together the whole knowledge of the middle ages. The first modern English work of the kind was the anonymous *Universal, Historical, Geographical, Chronological and Classical Dictionary,* which appeared in 1803. The *Cyclopædia* of Ephraim Chambers, in 1728, was the first to use cross-references. It was a French translation of this work which

Diderot used in making the famous *Encyclopédie*, which became the organ of the most advanced and revolutionary thought of the time, and gave a name, the *Encyclopedists*, to a party of philosophers and politicians. The great *Encyclopædia Britannica* first appeared at Edinburgh in 1768-71, and has since gone through ten editions. Other popular encyclopædias are Charles Knight's *Penny Cyclopædia* and *Chambers' New Encyclopædia*. Of American works may be mentioned *The Americana*, the *New International* and the *Universal Cyclopædia*.

En'dicott, John, colonial governor of Massachusetts, was born in 1589, at Dorchester, England, and landed as manager of the plantation of Naumkeag (Salem) in 1628. In 1630 London's Plantation became a part of the government of New England, and Endicott gave place to John Winthrop as governor. Six years later he headed a bloody but useless expedition against the Block Island and Pequot Indians. Except for five years, he was deputy-governor or governor of the Massachusetts colony from 1641 to 1665. Endicott was a zealous Puritan, high-tempered, kind and brave. He manifested some personal peculiarities: He cut out the cross from the military standard, had four Quakers put to death, forced the women to wear veils at public assemblies and was opposed to long hair. He died at Boston, March 15, 1665.

En'dosperm (in plants). A food-tissue within the embryo-sac (which see) of seed-plants and used by the embryo. It makes up the bulk of many seeds, as in pines and the cereals, and contains stored food of various kinds, prominent among which is starch. It is sometimes soft and mealy, and in other cases it is horny. In the so-called vegetable ivory it is as hard as the name suggests. An obsolete name for it is albumen. In the alternation of generations (which see) it is a gametophyte, and being associated with the egg it evidently is a female gametophyte. See SEED.

Endym'ion, in Greek myth, a youth famous for his beauty and never-ending sleep. As he slept on Mt. Latmos in Caria, his beauty warmed the cold heart of Selene (the moon) who came down to kiss him and to lie by his side. It was said that Selene had sent him to sleep that she might kiss him without his knowing. On this story Keats wrote his well-known poem *Endymion.*

Enfield Rifle. See RIFLE.

Engine. See STEAM-ENGINE.

Engineering, the work of constructing, designing or operating machines or other structures or equipment having for their aim the economic and scientific utilization of the various forces and resources of nature for the purposes of man. Originally engineering could be classified under the two main headings of civil and military engineering, but modern developments have been so great as to bring into prominence many different forms, such as mechanical, mining, electrical, chemical and sanitary engineering, leaving the term civil engineering to such phases, exclusive of strictly military and marine work, as are not included under these special headings. The old distinction between the civil and military engineer is rapidly disappearing.

The work of engineers is in connection with such things as canals, harbors, bridges, railways, mining and metallurgical plants, factories, sewage-systems, city water-works, lighting and power-plants, machines of various kinds, submarine boats etc. In fact the services of the engineer are required in nearly all modern industrial, municipal and military operations which are to be economically, methodically and scientifically carried out on an extensive scale. All of the discoveries and laws of science and mathematics are here practically applied and utilized for the improvement of man's material wellbeing so far as the ingenuity of the engineer will permit. Thus the utilization by modern engineers of steam-power discovered by Watt now enables one man to do as much work as formerly required thirteen or fourteen hundred men.

The military engineer in the field has to see to such things as the overcoming of obstructions to the marching or transportation of troops, military surveys, construction of maps, selection of camping-grounds, communication, field-fortifications, methods of siege etc. The term ordnance-engineer is often given to those officers whose work consists in designing or constructing cannon or firearms. Engineers of all kinds are now employed in connection with military and naval works, but they are not usually called military engineers unless given a military commission.

The preliminary training for engineers is given in the various technical schools, but one can scarcely hope to be entrusted with important engineering works until he has had several years of practical experience. For the degree of C. E. or M.E. most engineering schools of repute require four years of undergraduate work, about three years of successful experience and one year of graduate work. The four-year courses for the most part aim to give a thorough grounding in mathematics and physics, with special reference to the various forms and applications of power, the strength and qualities of the ordinary materials used in construction, freehand and mechanical drawing and the use of the common engineering instruments. A considerable amount of time is also expected to be spent in practical shopwork.

As the work of the engineer requires a considerable amount of maturity and ability to secure a firm, accurate grasp of fundamental relations, it is best that one should have a good general education before entering upon an engineering course. In the meantime much help can be gained from the different magazines dealing with engineering and scientific subjects, as the *Scientific American* and the accounts of the proceedings of the engineering societies of which there are many in the United States, national, international and local.

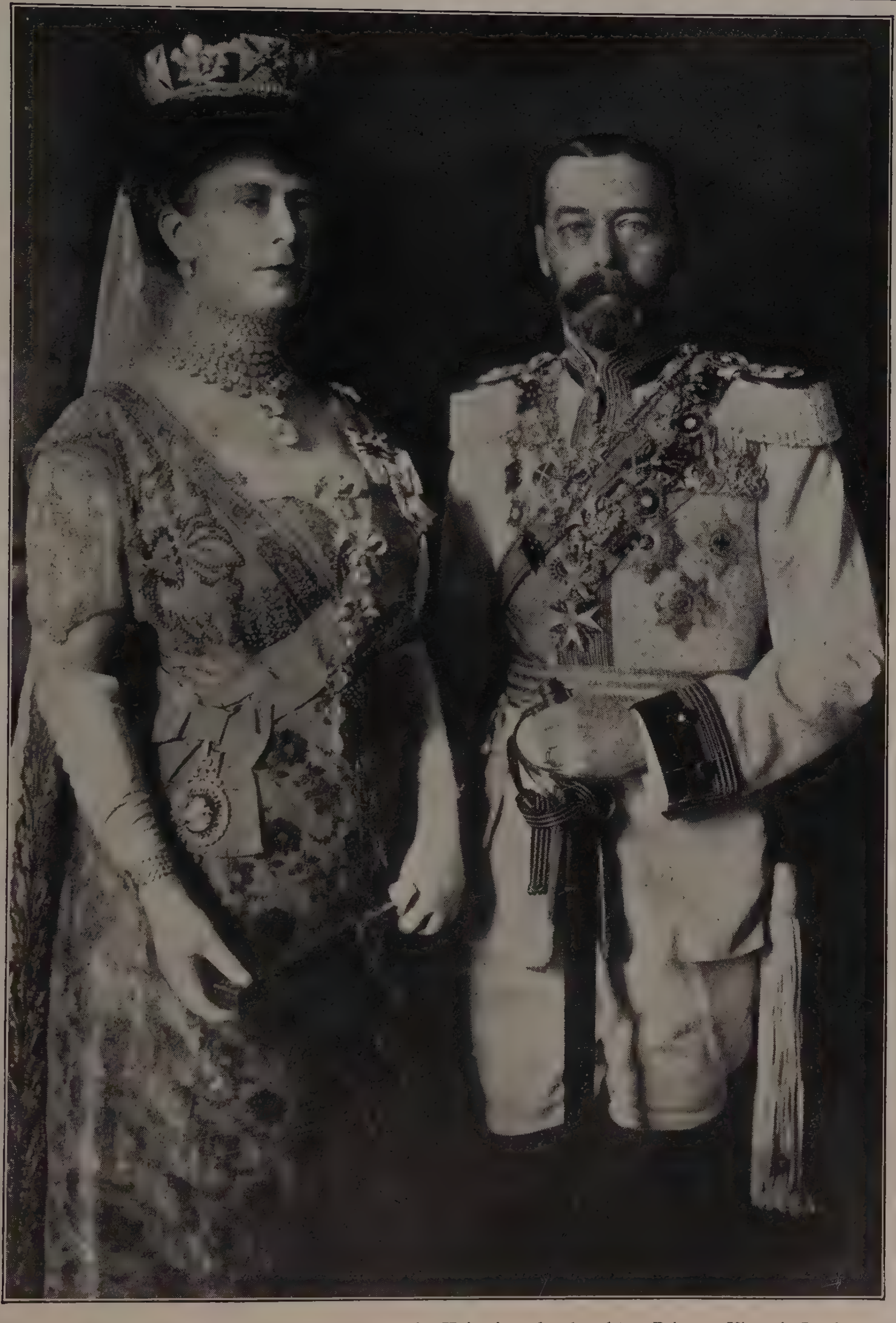
The opportunities at the present time for the skillful and reliable engineer are excellent, particularly if one has ability as an administrator. It will become more and more desirable in future for the railroad president, the factory-superintendent, the mine-manager etc., to have a knowledge of the technical side of his work, and such positions will more and more demand technically trained men. In the field of construction, while, comparatively speaking, the great bulk of railroad-track has already been laid, much work yet remains to be done in the building of branch-lines, cutting down grades, improving track-beds and in the solution of the growing problems of city-transportation, sanitation and farm-irrigation. In the fields of chemical and electrical engineering, the possibilities are simply unlimited. A single new discovery or invention might lead to a complete revolution of our industrial life. For instance: the discovery of a cheap means of separating aluminium from clay might lead to a discarding of the use of iron for a great many purposes; or the perfection of an electric storage-battery might do away with the use of steam-power almost entirely. Even the problem of aerial navigation may soon come to engage the serious attention of the sober-minded engineer.

The prospective engineer can make no mistake in taking time and patience to learn in detail the practical workings of his own particular line from the ground up. As to financial returns, the engineer is more fortunate than the doctor or the lawyer in that he is usually able to command a fair salary for his work from the outset, while the ultimate returns of his mature labor may be very large. The qualities most essential to the success of the engineer are energy, practical judgment and a painstaking, accurate temperament. Early indications of engineering ability may be shown by fondness for mechanical contrivances and by interest in the practical side of scientific and mathematical studies.

Eng′land, is the southern, largest and far the most populous portion of Great Britain. In shape it forms an irregular triangle, of which the eastern side measures in a straight line 350 miles, the southern 325 miles, the western 425; but its shores are so deeply cut by bays as to make the coast-line longer in proportion to the size of the land than in any other country save Scotland and Greece. England has for hundreds of years been one of the leading powers of Europe, but her area is small. England, without Wales, covers 50,222 square miles, about the size of Rumania, less than a fourth of France or Germany, and but little larger than New York state. Twenty-nine states are each larger than England; several indeed are larger than the entire United Kingdom. England owes her name to the Engles or Angles, who, with the kindred Jutes and Saxons, conquered the greater part of what had been known as Albion or Britain. England's climate is milder on the whole than that of any region as far north. The northwest is mountainous and hilly, the east and south mainly a plain crossed by lines of low hills. It is much more fertile than Scotland or Ireland, for 80 per cent. of its area is productive. It is very rich in coal and iron. The English are made up of many races. A non-Aryan race, perhaps Euskarian, inhabited the country before the Celts, who conquered them and intermarried with them. The Roman armies brought settlers with them — Gauls, Germans, Iberians, Italians, Dacians, Phrygians and the other races which made up the legions of the empire. Then came the Angles, Saxons and Jutes, followed by the Danes and Norman-French. Out of these various stocks a well-marked race has been formed, self-reliant, prompt to defend its rights, daring, hard-working and ambitious, which has given its language and, in part, its institutions to 250,000,000 of the world's people. England became the headquarters of machine-making of all kinds, of steam-power, of commerce, navigation and shipping; but she was not the first of European states to start in the race of commerce. Long after France, Flanders and parts of Germany were great manufacturing centers, England was a farming and wool-producing country. Agriculture was at its height in the reign of George II, when the agricultural wealth of the United Kingdom was $2,905,000,000, and made up half the wealth of the nation. At present (1911) the yearly imports of the United Kingdom are over $3,400,000,000, in order of value as follows: Grain, including potatoes, raw cotton, manufactures, meat, wool, sugar, dairy-products, tea and coffee, timber, minerals, wines and spirits, flax and jute, raw silk. The yearly exports reach over $2,700,000,000, in order of value: Cotton-goods, iron, woolen-goods, machinery, coal, linen, jute goods, metals other than iron, cutlery, silken goods. The shipping of the United Kingdom is 42 per cent. of that of the world, while its wealth is put down at $46,140,000,000.

Cæsar's raid into Britannia, in 55 B. C., was followed by the Roman conquest; but the history of England does not properly begin till the 5th century, when the Teutonic tribes which have given the nation

GREAT BRITAIN'S KING AND QUEEN



This picture was taken at the wedding of the Kaiser's only daughter, Princess Victoria Louise, to Prince Ernest of Cumberland. The King, in honor of the occasion, is dressed in the uniform of a German cuirassier. The Queen's dress is of cloth of gold with a long train. Her majesty wore a diamond tiara and ropes of magnificent diamonds round the neck, with a diamond pendant composed of two enormous stones.

its name gained a foothold on the island. Before 600 A. D., Saxons and Angles had made settlements as far north as the Forth, and the many princedoms had merged into the two rival powers, Northumbria and Kent, while a third, destined to devour the other two, was Wessex to the south. Long before England became one nation, its people were united by belonging to a single Christian church. The marriage of the king of Kent with a Frankish princess gave an opportunity for Augustine and his fellow-missionaries to land in 596; and the marriage of a Kentish princess with Edwin of Northumbria carried Christianity from Canterbury to York. In 802 Egbert, who had learned at the court of Charlemagne how to conquer, became king of Wessex, and brought all England under his power as far north as the Dee. The Danes, as robbers, then as settlers and lastly as conquerors, harried the Saxons for 200 years after the death of Egbert. Alfred, by surrendering the north and east of England to be held as vassals of the Saxon king, secured the supremacy of Wessex. The reign of Edgar the Peaceful and the government of his great minister, Dunstan, closed the period of Saxon greatness. By 1012 the Danes had triumphed, and Sweyn, the leader of the invaders, was in fact king of England. Under his son, Canute, England was in some respects the head of a Scandinavian empire. But his two sons were weak, and with the aid of Godwin, the powerful earl of Wessex, Edward the Confessor re-established the Saxon line. On the death of Edward, Godwin's son Harold was recognized as the ablest man in the kingdom, and was chosen king. His banished brother, Tostig, was defeated at Stamford Bridge, but three days later Harold was himself defeated and slain in the battle of Senlac, near Hastings, by William the Conqueror, Oct. 14, 1066. With William began England's connection with the continent and the bringing in of feudalism. The Norman kings, when their time was not taken up by foreign wars, were occupied by strengthening against the nobles and the church the powerful monarchy founded by William.

Though the enormous power wielded by the Norman line was of great use to the nation in checking the barons, who were the oppressors of the serfs, its evils were seen when it came into the hands of boastful, tyrannical and weak King John. Disgraced in the eyes of all England by his allowing himself to be stripped of all his French possessions and by being excommunicated and deposed by the pope, the nobility appeared as the true leaders of the nation and wrung from the humbled king that great charter which secured the foundations of the future liberty of England. To make the charter a reality and secure the orderly growth of these liberties was the work of the great King Edward I. The attempt of Henry III to disregard *Magna Charta* caused the successful rebellion headed by Simon de Montfort. But in the reign of Edward I a parliament assembled (1295), and the principle that where all were concerned all should have a voice was acknowledged. Great powers were left to the king, but Parliament was armed with the right to tax, and steadily increased its grip on affairs till, at the close of Edward III's reign, it could impeach the ministry. Richard II's unwise claim to the sole power of the crown brought on the revolution that closed the struggle, and Henry IV came to the throne as the choice of Parliament, while the council named by Parliament became, in fact, a body of national ministers. Edward I died before he had finished the conquest of Scotland, and his weaker son, Edward II, had been badly defeated by the Scots at Bannockburn. Edward III's attempts to make himself king of France were mere raids of no lasting value, except so far as the life of the peasant-soldier helped to free the lower orders from serfdom. The French wars of Henry V were much more successful than those of Edward III, and the union of the two kingdoms seemed to be promised when the great king died. The manhood of Henry VI ushered in the Wars of the Roses between the two branches of the Plantagenets, the houses of Lancaster and York. The Yorkists won, and the powerful and despotic Edward IV ruled with a strong hand, and Parliament in his reign had little power. But his successor, Richard III, made himself hated by all classes of the people, and the battle of Bosworth put on the throne Henry VII, the first of the Tudors, who acknowledged that he was king by the will of the people. In Henry VIII determination to have his own will was blended with a real desire for the well-being of his people. Driven by his passion for Anne Boleyn, Henry demanded a divorce from his Spanish wife, and the opposition of the pope brought to a crisis in England the Reformation, which had been smouldering since the days of Wiclif. But Henry's zeal as a reformer overshot the mark, and it was with a general feeling in her favor that Mary the champion of the old faith, ascended the throne. Unfortunately, she allied herself too closely to Spain, and it seemed likely that England might become a Spanish dependency. So when Elizabeth came to the throne, Protestantism and national independence were linked together as one cause; and she, as well as Mary, was at first supported by the bulk of the nation. Her great minister, Lord William Cecil, played such an able part that, without openly defying the great Catholic powers, she came to be looked to at home and abroad as the champion of Protestantism; and the strength of the nation was built up till it could drive from the coasts of England the Spanish Armada.

On the death of the queen the crown passed to the Scottish king. James I came to the throne more by right of inheritance than by choice of Parliament. His title was declared to be by divine right, as it was then called, but he was used to Scotch, not to English, ideas of the rights of the crown. The rights of Parliament had been decided when the house of Lancaster was on the throne, but now had to be fought for all over with the house of Stuart. The struggle came to a head under Charles I, from whom was forced the great Petition of Right. Then followed the Civil War and the trial and execution of Charles. But Parliament now found itself mastered by the overwhelming ability of Oliver Cromwell, who had been brought to the front as a successful general in the war. He succeeded in raising England to a high place among nations, but on his death and the prospect of a succession of military tyrannies Charles II was asked to be king. At once the struggle between king and Parliament began again; and, though Charles died seemingly triumphant, the want of judgment, little short of blindness, of his brother, James II, in a few years brought things to a head. Invited by the leaders of the Whig party, William of Orange had but to lead to put an end to the Stuart dynasty and drive James from the country. William was the first parliamentary king; for before power was put in his hands a binding charter set forth the liberties of the country. When the last attempt of the Stuarts to regain the throne was thwarted in 1715, Parliament settled the Hanoverian house upon the throne, and since that time through the reigns of the four Georges, William IV and Victoria, England has had what is called a constitutional government. It was in the reign of Anne that party-government began. Marlborough did not have complete success in his wars till he found himself supported in 1708 by a ministry all of one party. From that time the ministry, really a committee of the majority of the house of commons and known as the cabinet, has formed a part of the machinery of government. Under Elizabeth England had become a world-power, but not till the Revolution of 1688 did it become a power of the first rank in Europe. Then, under William and Marlborough, England forced its way to the head of the European nations in the wars against Louis XIV. Under the great Chatham her navy was supreme upon the ocean, and under his greater son, Pitt, English money, English troops and English successes in Spain were the great causes of Napoleon's downfall. In the 19th century the wars the nation fought were avowedly in the interests of her colonies, while she kept more aloof from the politics of the continent. The most marked thing in the history of the 19th century was the rise into greater prominence of the trading, manufacturing and laboring classes, who were given representation in Parliament by the great reform bill of 1832. Since that time England has been slowly but surely growing into a real democracy. With the decease (May 6, 1910) of King Edward VII, George V succeeded to the throne, and rules over colonies and dependencies of the crown whose area (including that of the United Kingdom) is estimated at 11,894,000 square miles, with a total population (including that of the United Kingdom—45,300,000) estimated at 400 millions. The annual value of the imports and exports of the United Kingdom now exceeds 1,257 millions of pounds sterling; while its reputed wealth is close upon 12,000 million pounds sterling. The percentage of national debt of the kingdom to its wealth is 5 per cent. only. Its navy, consisting of battleships, cruisers and torpedo-vessels, comprises a total of about 597 vessels, manned by 134,000 officers and men. The value of the exports of merchandise of home-production from England, in the year 1911, was 454 million pounds sterling; her exports, in the same year, of colonial and foreign produce were 102 million pounds in addition. England's exports have, of recent years, shown no vast increase, owing to the increased competition of this country and of Germany, especially in the production of iron and steel, in which the United States is beating her in the world-market. Britain is also exhausting her available coal resources at a rapid rate, though recent official estimates assert that these will last many centuries.

England is divided into 45 counties. Nine cover over 1,000,000 acres each, the largest being York. Seven have a population of over 1,000,000, the largest being London. Her national funded and unfunded debt in 1910 amounted to about 713 million pounds sterling, the annual charge on the budget for which was 28 million pounds. In the new (1910) parliament Great Britain returned 670 members. Population of England and Wales 36,075,269, and that of the United Kingdom is 45,216,741. See the histories by Green, Freeman, Froude, Stubbs, Lingard, Hume and Macaulay and the *Epochs of Modern History* series.

English Channel. See CHANNEL, ENGLISH.

English Language, The, now spoken by 130 millions of people as their native tongue, especially in the British Isles North America, South Africa and Australasia, was in the fifth century A. D. the speech of but a few thousand Teutons who landed in England from their homes about the mouths of the Rhine, the Weser and the Elbe. At that day the English language probably had some 2,000 words; at present its vocabulary is variously estimated at from 38,000 to more than 100,000 words. The English-speaking Angles, Saxons and Jutes became the conquerors of the Britons from whose language they adopted a few Celtic terms. Most of these words had reference to domestic occupations, as for example *clout*, *cradle*, *darn*, *mop* and *pillow*. English belongs not to the Celtic but to the Teutonic group of the Indo-European family of languages. Owing to the fact that it was originally spoken by the dwellers on the low-lying coastal plains which border upon the North Sea, it is often described as the "Lowest" variety of the Low-German speeches. Even at the present time English is closely akin to the Dutch, the Flemish and, especially, the Frisian dialect.

Before the end of the 6th century the position of the English in Britain had been secured. The Angles gave their name to the language. There however were several dialects in the old English speech; and these dialects endured for several hundreds of years. Old English or Anglo-Saxon was a highly inflected tongue. Nouns and adjectives had several declensions, nouns had five cases, and verbs were distinguished by far more inflexions than is at present the case. The poems of Cædmon and Cynewulf and the prose of King Alfred illustrate the English of this period. Alliteration was the device employed in poetry in the place of rime. The Anglo-Saxon forms of poetry and prose survived the Norman Conquest, but the opening of the 12th century saw the rise of an important stream of Norman-French influence. The two principal books written in English between 1100 and 1250 are the *Ormulum* of Orm and the *Brut* of Layamon; and these books, although their forms are still Anglo-Saxon, already contain many French words.

In the Middle-English period, between 1250 and 1500, the old English inflexions gradually but finally disappeared. This was a natural result of the Norman and French intolerance of strange inflexions, but the disappearance of inflexions had begun even before the Conquest. Foreigners were willing to learn English words, Englishmen were forced to learn foreign words; but neither Englishmen nor foreigners found it necessary to retain the endings of the early English grammar. French was the fashionable and literary language during most of this period; but the use of it declined from the middle of the 14th century. In 1362 an act of Parliament permitted the use of the English language instead of Norman-French in the law-courts. In the latter part of this period the English language in the hands of Geoffrey Chaucer (1340-1400) touched a literary height hitherto unknown.

During the Tudor period and, above all, during the reign of Queen Elizabeth the English language became, as it were, standardized in poetry and prose. Shakespeare and Marlowe in the drama, Spenser and Milton in the epic and Hooker, Bacon and the compilers of the English Bible and Prayer-Book in prose founded a body of classic literature that gave to English a unity of form which had been sadly wanting in the Middle-English period. Meantime many foreign words crept into the English tongue. The revival of learning was responsible for a vast influx of terms borrowed or coined from the Latin and Greek, but principally the Latin.

Modern English has changed comparatively slowly, except by the adoption of new terms to express new ideas or to denominate novel inventions and things. Many of the new terms in Modern English are of a technical or scientific nature. Tennyson and others have attempted to revive good English words that had been for some reason forgotten. It is unfortunate, perhaps, that the English language no longer lends itself to the formation of compound terms after the fashion of German and the oldest English tradition. [It virtually forms compounds still, though the *form* is not always that of a compound.]

To conclude, English is a composite language. It includes a few Celtic terms and many Latin terms; but the body of the language, including most of its common and familiar works, is of Teutonic origin. Of the Latin terms, a few were introduced during the Roman occupation of Britain, many more through the French and many philosophic and scientific words through the Renaissance movement. Modern scientific terms in English are largely constructed from Greek roots; foreign words have been freely added whenever needed, as in commerce.

Engraving, in the strict sense of the word, is the art of graving or cutting marks or figures upon tablets of any hard substance. Certain forms of the art—as engraving for ornamental purposes upon metal, engraved writing upon tablets, gem-engraving in making signets, cameo-engraving etc.—are very old. But in a more special sense the word engraving is understood to mean the cutting of designs upon metal-plates or blocks of wood for the purpose of printing impressions from them in ink upon paper. Engravings of this sort are divided into engravings upon metal, in which the lines to be printed are sunk in, and engravings on wood, in which the lines to be printed stand out in relief, the wood between them being cut away. In metal-engravings the plate, having been inked and wiped on the surface, keeps the ink only in the hollowed lines, from which it is conveyed to the paper by the pressure of the printing-press. In wood-engraving only the raised part of the block is inked, by means of a roller, and it prints as a raised type.

The metal most commonly used for engraving has been copper; but during the 19th century steel was largely used on account of its hardness, which enables it to stand the wear of printing and to throw off a far larger number of impressions than could possibly be got from a copper-plate. Steel, however, is less readily engraved than copper, and the finished engraving is thus apt to be not so good. By a late invention the surfaces of copper-plates are protected by a very thin coating of steel, placed upon them by an electric battery, which enables them to give a larger number of good impressions without being worn. Zinc-plates have also been used for etchings. In line-engraving the main tool used is the burin or graver, a small bar of steel, pointed at one end and with the other fixed in a rounded wooden handle. This burin is held between the engraver's thumb and forefinger and pushed forward by the pressure of the palm on the handle, and cuts upon the plate of polished metal a line, broader or deeper according to the pressure and the angle at which the burin is held. In etching the plate is coated with a thin, transparent surface or ground that acid will not eat. The plate is then smoked black, so that the lines drawn by the etcher will show the shining metal underneath. The design is drawn with an etching-needle — a sharp steel point in a handle. The needle merely takes away the ground, showing lines of the bare metal ready to be acted on by the acid. The back of the plate is coated to protect it, and the plate is put in a nitric-acid bath. The acid attacks and corrodes or eats the metal along the lines drawn. When the lines which are to be the lightest and palest in the etching are bitten, the plate is taken out, and these lines covered with a varnish which keeps the acid from eating them any deeper. Then the plate is put back for the acid to eat the other lines out more deeply, till the etching is finished. What is called soft-ground etching is simply another method (of which there are many) of drawing the design. In mezzotint engraving the plate is roughened — raising a "bur" of small metal points — so that if the plate were then inked and printed it would yield a uniform black impression. The mezzotinter draws his design and then scrapes away all but the lines he wishes to appear black in the printed engraving. Engraving in recent times has suffered much because of the work done by photographic processes. The beauty of what are known as photogravures or heliogravures, reproducing paintings, drawings and photographs, makes it likely that this process will altogether take the place of engraving. See WOOD-ENGRAVING, LITHOGRAPHY, PHOTOGRAVURE; also *Etcher's Handbook* by P. G. Hamerton; Ottley's *Early History of Engraving;* and Bryan's *Dictionary of Painters and Engravers.*

Enid, county-seat of Garfield County, Oklahoma, 50 miles from El Reno. It is located in a good agricultural region, in which the leading crop is wheat. Its industries include railroad-shops, flour-mills, a brick-works, yeast, broom and ice-factories. It has good schools, a fine courthouse and substantial business-blocks. The city was established in 1893, at the opening of the Cherokee strip, and has grown steadily. It has the service of three railroads and a population of 15,799.

En'silage or silage, the general name given to green crops, especially corn, packed in enclosures constructed for that purpose called silos, to be fed to stock. The practice of thus preserving green crops for fodder originated about 1800, and in the United States about 1875.

Silos are quite simple in construction They may be built of wood, and so are comparatively inexpensive. The essential points to be observed in their construction are (1) to have the walls as smooth as possible inside, (2) to have few corners, preferably having it round or square and (3) to have them as nearly air-tight as possible. If built of wood, the walls may be coated with coal-tar.

In filling the silo with corn, the entire plant is taken at maturity, just before the leaves begin to lose their moisture. It is cut into pieces one or two inches long and then closely packed in. If the silo is air-tight and the corn is evenly and tightly packed, there is little danger of its spoiling. If the crop is unusually dry, a considerable amount of water should be poured upon it while it is being packed. The layer at the top may be kept from spoiling by covering it with eight inches of chaff or cut-straw until ready for use.

It is calculated that food equivalent to four tons of hay can ordinarily be produced from one acre of corn. This makes corn preserved in a silo a profitable crop, especially as it can be so compactly and economically stored. Though corn is the most satisfactory crop for ensilage, red clover, oats, rye, alfalfa, millets and cow-peas are also used. About one cubic foot of silage (30 or 40 pounds), along with other foods, is considered the right quantity per day for one cow. Though silage has been successfully fed to horses, sheep and beef-cattle, it is especially suitable for milch-cows, and a silo is consequently an important adjunct of a modern economical dairy-farm. Care should be taken to give relatively small amounts of silage to dairy-cattle until they become accustomed to it. In composition silage is not materially different from the fresh green corn.

Entomology. See Insects.

En′zymes (often called soluble ferments), substances of unknown but very complex composition produced in plants and animals for digesting insoluble foods or those which cannot be used readily without such change. The changes they produce are of two sorts: (1) the commoner consists in causing the food to take into its composition an additional molecule of water; (2) without any additions it may be split up into two or more compounds. Enzyme itself does not take part in the chemical reaction, but seems to act only by its presence. Consequently a very small amount of an enzyme may digest large quantities of a food. Each enzyme is restricted in its action to a particular substance. Some of the more important enzymes, the substance on which they act and the chief products are shown in the following table:

ENZYME	SUBS. ON WHICH IT ACTS	PRODUCT
Diastase	Starch	Malt-Sugar
Ptyalin	Starch	A sugar
Cytase	Cellulose	A sugar
Invertase	Cane-Sugar	Grape-Sugar and Fruit-Sugar = "invert sugar"
Maltase	Malt-Sugar	Grape-Sugar
Inulase	Inulin	Fruit-Sugar
Emulsin	Glucosides	Glucose, etc.
Pepsin	Proteids	Peptones
Trypsin	Proteids	Amides
Lipase	Fats	Glycerin, fatty acids
Zymase	Sugars	Alcohol, carbon dioxid

Epaminondas (*ē-păm′ĭ-nŏn′dȧs*), the greatest of Theban generals and statesmen, was born toward the end of the 5th century B. C. He was descended from an old family which had become poor, and he was unknown till he was 40 years old. He is said to have saved the life of Pelopidas in battle in 385, which was the beginning of one of the most famous friendships of olden times. Thebes had been in the hands of a Spartan garrison, but when they were driven out by a desperate but successful stratagem, Epaminondas stepped forward at once into the ranks of the patriots. He was sent to Sparta in 371 to bring about a treaty of peace between the two countries. Here he displayed as much firmness and dignity as eloquence in the debate which ensued upon the question whether Thebes should sign the treaty in the name of all Bœotia. This would have been a recognition by Sparta of her claim to be supreme over all the Bœotian towns. To this the Spartans objected, and the war went on. Epaminondas was given the chief command, and, along with Pelopidas, with an army of 6,000 men defeated twice that number of the enemy at Leuctra (371). Two years later, with Pelopidas, he marched into the Peloponnesus and persuaded several of the allied tribes to fall away from Sparta. On going back to Thebes, Epaminondas was accused of having broken the laws of his country by keeping the chief power in his hands beyond the time appointed by law, but he made a strong defense and was acquitted. In the spring of 368 the war between Thebes and Sparta was renewed with greater fury than ever. Epaminondas made a second and somewhat unsuccessful invasion into the Peloponnesus. To make up for this unsuccessful undertaking, he marched with 33,000 men into Arcadia, and joined battle with the main body of the enemy near Mantinea in 362 B. C. Epaminondas charged at the head of his men and broke the Spartan phalanx, but was fatally wounded in the breast by a javelin. Being told by the physicians that he would die as soon as the weapon was extracted, he waited till he heard that his Thebans had won the victory, then drew out the javelin with his own hand, saying: "I have lived long enough." His death was the death-blow to Theban supremacy.

Ephesus (*ĕf′ê-sŭs*), one of the twelve cites of Asia Minor settled by the Ionian Greeks, was in Lydia, near the mouth of the River Cayster. It was long before Ephesus became of importance, though a sacred city from an early time. Conquered first by the Lydian and next by the Persian kings, it came, after the death of Alexander the Great, under the government of his favorite bodyguard, Lysimachus, by whom it was greatly strengthened. At last it came into the possession of the Romans. In the time of Augustus it was the greatest place of trade of all the cities of Asia west of the Taurus. This was its position when visited by St. Paul, who lived here for three years, and wrote one of his great letters to its Christian church. But the destruction of its great temple by the Goths in 262 A. D. gave it a blow from which it never recovered. In 431 the third great council of the Christian church was held here. Its general history, while a city of the Byzantine empire, was unimportant, and before the days of Tamerlane, it had almost wholly perished. Among the ruins of Ephesus are fragments of a great theatre—alluded to in the account of St. Paul's preaching in the city—of a music-hall and of many walls and towers. About a mile northeast of the city was the famous temple of Diana. This wonderful building, one of the seven wonders of the world, was set on fire by an Ephesian, it is said, on the night Alexander the Great was born, thereby to give him an undying name. It was afterward rebuilt by the people in greater splendor than before, even the women giving their jewels to raise the necessary money. It was the largest Greek temple ever built, being 425 feet long and 220 wide. It had 127 columns, each sixty feet high. It was filled with statues and pictures made by the best of Grecian artists. The altar of the goddess was adorned with the work of Praxiteles. It was robbed of its treasures by Nero, burned by the Goths, and finally destroyed in the reign of the Roman Emperor Theodosius I, who issued his celebrated edict against the ceremonies of the pagan religion in 381 A. D. The site of the temple was discovered in 1869, and excavations were made until 1874, which have greatly increased our knowledge of this wonder of the world. See Falkner's *Ephesus and the Temple of Diana.*

Epictetus (*ĕp'ĭk-tē'tŭs*), a celebrated Greek philosopher, was born at Hierapolis, in Phrygia, about 50 A. D. He at first was a slave and stood his master's harsh treatment like a true Stoic. After being freed, he studied philosophy, and with other philosophers was driven into exile by the Emperor Domitian. He settled at Nikopolis in Epirus. He left no works behind him, but his pupil, Arrian, who wrote a life of Alexander the Great, gathered his sayings and maxims with a lover's care into the *Enchiridion* (Hand-book) and into eight books of commentaries, four of which are lost. These show the simple and noble earnestness of the philosopher's character, as well as his real, heartfelt love of good and hatred of evil. He is one of those who, "groping in the deeps of thought, touched God's right hand and knew it not." See Farrar's *Seekers after God.*

Epicurus (*ĕp'ĭ-kū'rŭs*), a famous Greek philosopher, was born in 342 B. C. on the island of Samos, where his father was a school-master. When eighteen he went to Athens, but soon came back to Asia. He studied philosophy, and at Mitylene, in his thirty-second year, he first opened a school of philosophy. After teaching five years, he went again to Athens in 307 B. C., and set up a school of philosophy in a garden which he bought and laid out for that purpose—whence his followers were called the "philosophers of the garden." Although Epicurus taught that pleasure is the chief good, the life that he and his friends led was one of the greatest simplicity. They were content, we are told, with a small goblet of light wine, and the rest of their drink was water. And an inscription over the gate promised to those who might wish to enter no better fare than barley-cakes and water. Epicurus was very successful as a teacher. Great numbers flocked to his school from all parts of Greece and Asia Minor, most of whom became fond of their master as well as of his teaching, for Epicurus seems to have been no less amiable and kind a man than a man of force and brains. He wrote a great deal. According to one account, he left 300 volumes on Natural Philosophy, Atoms and the Vacuum, Love, the Chief Good, Justice and many other subjects. These works are lost. The only writings that have come down to us are three letters, a few fragments from one of his works and a number of his sayings. The main sources of our knowledge of his teachings are Cicero, Plutarch and, above all, Lucretius, whose great poem, *De Rerum Natura* (On the Nature of Things) contains the Epicurean philosophy. According to Epicurus the great evil with which men were troubled—the load which weighed down man's happiness—was fear—fear of the gods and fear of death. He did not deny that there are gods, but taught that as "happy and undying beings" they could have nothing to do with the affairs of the world or of men. For, he said, business and cares and anger are not in accordance with happiness, but arise from weakness, fear and dependence on others. He believed that the soul was a bodily substance, made up of fine particles scattered through the whole body, and, this being so, that soul and body died together. He therefore argued that the most terrible of all evils, death, is nothing to us, "since where we are, death is not; and where death is, we are not" He held that pleasure was the chief good, and it is from misunderstanding of the meaning of this word as used by him that the term Epicurean came to mean one who gave loose rein to all his likes and appetites. For, he tells us, it is not ceaseless drinkings and revelings, nor rare and costly viands, that make up a pleasant life, "but freedom of the body from pain and the soul from care." Among the Romans the system of Epicurus was adopted by many distinguished men, such as Horace and Pliny the Younger. In modern times many prominent Frenchmen have professed to be Epicureans. Epicurus died at Athens in 270 B. C. See Zeller's *Philosophy of the Stoics, Epicureans and Skeptics.*

Epider'mis (in plants), a specially modified layer of cells which covers all parts of higher plants. In the older parts of stems and roots, which increase in diameter year after year, the epidermis disappears, being replaced by other layers, usually cork. The epidermis is primarily a protective layer, which is interposed between delicate living cells and outside exposure. Since these living cells must effect exchanges with the outer world, the epidermis is not merely a protective layer, but must be organized in such a way that it may facilitate these exchanges. Its duties, therefore, are numerous. The epidermis is able to produce a variety of structures, conspicuous among which are hairs of many kinds. Wherever the epidermis covers green tissue it also organizes very numerous stomata, commonly known as breathing pores or automatic gateways, through which various gases pass in and out in connection with the work of the green cells. See figure under STOMATA.

Epig'ynous (*ē̇-pĭj'ĭ-nŭs*) **Flowers,** those in which the sepals, petals and stamens seem to arise from the top of the ovary. In such cases the ovary is often said to be inferior, that is, it is to be seen below the flower, as in the common honeysuckle. The contrasting term is hypogynous. Epigynous flowers are regarded as of higher rank than those that are hypogynous, and in the highest family, the Compositæ, the flowers are all epigynous. The noun form is epigyny. See FLOWER.

Epiphytes (*ĕp'ĭ-fīts*), commonly called air-plants, since they obtain all their food supplies from the air, having no connection with the soil or with water. They occur in great numbers in the tropics, especially the American tropics, and are found perching in great numbers upon other plants, the trees sometimes being almost covered with them. Many ferns have this habit, but it has been most cultivated by orchids and bromelias. The epiphytic orchids, with their dangling roots and odd-looking but brilliant flowers, are favorite greenhouse-plants. One of the common epiphytes of the United States is the so-called long moss or Spanish moss, which hangs in gray masses among the trees of the gulf states. It is not a moss, but a flowering plant, one of the bromelias.

Epirus (*ē̇-pī'rŭs*), meaning mainland, is the old name of a part of Greece lying between Illyria and the Ambracian Gulf and between the Ionian Sea and the mountain chain of Pindus. It is a mountainous region, heavily wooded and growing little wheat, though noted for its cattle and horses and for its breed of Molossian shepherd-dogs. Its best known river is the Acheron; its chief towns Dodona and Ambracia. In early times, as to-day, its people were only half Greeks, the Greek colonies being confined to the coast and southern portion. Of the Molossian kings of Epirus, the most famous was Pyrrhus, who long waged successful war against the Romans. On the conquest of Macedonia by the Romans (168 B. C.) the most revengeful measures were put in force against the Epirotes, who had helped Perseus, the Macedonian king. Æmilius Paulus, the Roman general, plundered and razed to the ground seventy towns of Epirus, and sold into slavery 150,000 of the people. From that time Epirus shared the good or bad fortunes of the Roman and Byzantine empires until 1204. Then small princes ruled the country until the 15th century, when it was at last conquered by the Turks. Epirus, peopled largely since the 14th century by the Albanians, formed latterly a part of the Turkish province of Janina. Under pressure from the great powers, Turkey ceded the strip of land east of the River Arta to Greece in 1881.

Ep'ping Forest, where kings hunted in the olden days, once covered all of Essex (England), and extended almost to London. Inclosures slowly curtailed it from 60,000 acres to 4,000 in 1871, when London undertook to preserve what was left and to recover the later inclosures. In 1882, at a cost of $2,000,000, 5,600 acres of Epping Forest were opened to the public. Easily reached from London, its nine square miles of almost unbroken woodland, which at High Beech or Queen Victoria's wood, rises 759 feet above sea-level, form one of the largest and most beautiful pleasure-grounds in Europe. See E. N. Buxton's *Epping Forest.*

Ep'som, a small town market of Surrey, England, fifteen miles southwest of London. The springs which made Epsom so fashionable a resort in the latter half of the 17th century, gave name to the Epsom salt, formerly made from them. The church, rebuilt in 1824, contains monuments by Flaxman and Chantrey. On Banstead Downs, one and a half miles south of the town, the most famous horse-races of the world are held yearly on Derby day. The grand stand was built in 1829-30 at a cost of $100,000, and seats 7,500 spectators. Population, 10,915.

E'quinox, the time when the sun is in the plane of the earth's equator. This occurs twice a year, once on March 20th, which is called the vernal equinox, and again on Sept. 22d, which is called the autumnal equinox. The name is derived from the fact that the length of the night then exactly equals the length of the day, since the parallel rays of light from the sun, on these dates, fall upon the earth perpendicular to the axis of the earth. The sun then appears to be on the equator, and hence the equinoxes are popularly spoken of as the dates on which "the sun crosses the equator."

Equisetales (*ĕk'wĭ-sē̇-tā'lēz*), one of the three great plant-groups which make up pteridophytes, commonly known as horsetails or scouring rushes. In early geological times the group was of great importance, and was represented by a great display of forest-forms. At present it contains but a single genus (*Equisetum*), represented by about twenty-five species. The equisetums have a very characteristic body. The stem is slender and jointed, and the joints separate easily. It is also green and fluted, and there is so much silica in the epidermis that the plants feel rough. It is on this account that the name scouring rush is sometimes used. Foliage leaves have been abandoned, but minute scale-leaves form sheaths at each joint. The stems are sometimes simple, at other times they branch profusely, but they are always green, since they do leaf-work. At certain times a cone-like structure, the strobilus, appears at the top of the stem, which bears the sporangia containing spores. Horsetails are found in wet ground or in very dry ground. Slender branching forms are very common along the sandy embankments of railroads. See PTERIDOPHYTES.

JOHN M. COULTER.

Era of Good Feeling, a name given to the period in American political life from 1817 to 1824, during which there practically was only one party—The Democratic-Republican. The Federalist party had almost disappeared by the end of the War of 1812, so that in 1821 President Monroe was reelected by an electoral vote of 231 out of 232. Differences of opinion regarding public works and the tariff question soon afterwards brought the era of good feeling to a close. By some historians the period is restricted to the second term of Monroe's administration.

Erard (*ā'rär'*), **Sebastien,** a French inventor and maker of musical instruments, was born at Strassburg, April 5, 1752. Going to Paris at sixteen, he started in business as a maker of pianos, completing his first one in 1776 or 1777. This was one of the earliest pianos made in France. He was soon considered the best pianoforte maker in Europe. The French Revolution drove him to London, where he established a factory. The grand piano was his invention, with a double-action harp and many other valuable improvements in the making of both pianos and harps. His pianos still have a reputation. He died at Passy, near Paris, Aug. 5, 1831.

Eras'mus, Desiderius, a Dutch scholar and philosopher, was born at Rotterdam, according to the date on his statue, in 1467. His guardians tried to induce him to enter a monastery, in order to obtain his property, and Erasmus, to please them, agreed to attend the Augustinian College of Sion, near Delft, where for six years he led the life of a monk. This life probably made him the bitter and sarcastic enemy of the monks that he was during the remainder of his life. He studied and taught in Paris till 1498. Among his pupils was Lord Mountjoy, at whose invitation, probably, he made his first visit to England, in 1498. He spent his time there mostly at Oxford. Six years spent in Paris give us the *Adagia*, a collection of Greek and Latin proverbs, and the *Christian Soldier's Dagger*. Another visit to England was made at the accession of Henry VIII, and on this journey he planned his *Praise of Folly*, a satire on kings and monks. He was professor of divinity and also of Greek, at Cambridge, for the next few years. In 1519 appeared his most famous work, the *Colloquia*, a series of talks on everyday subjects, the sharpness and boldness of which did much to prepare the minds of the people for the work of Luther. In 1516 his edition of the New Testament in Greek, the first published Greek text, appeared. He also edited scores of Greek and Latin texts. When the Reformation came, Erasmus stood between the two parties, and the last years of his life were spent in a long dispute and struggle with the friends and foes of the new religion, neither of whom he satisfied. In spite of these troubles, he enjoyed fame and consideration beyond that of any man-of-letters before or since. He died at Basel, Switzerland, July 12, 1536. See *Essays* by Milman, *Life* by Drummond, *Letters* edited by Froude and *Life* by Emerton.

Er'ebus, Mount, an active volcano in Victoria Land in the Antarctic regions. It was discovered by Ross in 1841, and named after one of his ships. It is 12,367 feet in height, and is the nearest volcano to the South Pole.

Erfurt (*ĕr'fŏŏrt*), a city of Prussian Saxony and the ancient capital of Thuringia, is thirteen miles from Weimar. Its two citadels once were monasteries. It was a strongly fortified city until 1873, its position on the central road through Europe giving it importance. Its cathedral, one of the oldest Gothic buildings in Germany, has very fine sculptures and bronze castings, one especially, a *Coronation of the Virgin*, which dates from the 16th century. The Augustine monastery, known as the home of Martin Luther, is now called the Martinsstift (Martin's Institute), and is used as an orphan asylum. The growing of flowers and vegetables and the raising of flower seeds are two of the principal industries. There also are manufactures of woolen, silk, cotton and linen goods, lamps, machines, shoes and beer. It was made a bishopric in 741. Since 1803 it has belonged to Prussia, except during 1806–14. The congress of Erfurt, held in 1808, was attended by Napoleon, the emperor of Russia and several princes of Germany. Population, 111,461.

Erg, the unit of work employed in physics and chemistry. It is defined as the amount of work done by a force of one dyne when exerted through a distance of one centimeter. It requires forty-two million ergs of work to heat one gram of water one degree centigrade, that is,

1 calorie$=42\times10^6$ ergs, very approximately.

Er'got, a very astringent drug, obtained from a certain phase (the sclerotium) of a fungus which is parasitic in the young ovaries of grasses, ordinarily of rye, and known as *Claviceps purpurea.* These sclerotia are usually elongated, dark-violet masses, which are conspicuous in the heads of rye. The fungus belongs to the *Ascomycetes*, which see.

Ericsson (*ĕr'ĭk-sŭn*), **John,** a great Swedish engineer, was born at Langbanshyttan in 1803. He entered the Swedish army, but left it after several years' service, to give his entire time to his inventions. He gained a prize in England for the best locomotive; and the principle which he introduced, of making a draught artificially so as to do away with the huge smoke-stacks which had been in use, is still employed. He invented soon after a steam fire-engine and the screw-steamer. In 1839 he came to the United States, and designed the screw-propeller for the warship *Princeton*, the first steamer that had her engines and boilers below the water line, so as to be out of the reach of shot. During the Civil War he built for the government the iron-clad vessels called monitors, from the name of the first one. These ships had a turret that turned by machinery, so that the guns could be pointed in any direction. Though laughed at by sailors, who called them a "cheese-box on a raft," they were very successful and formidable, and became famous all over the world. Among his numerous inventions are a gauge for measuring fluids when under pressure, an alarm barometer, a meter to measure the quantity of water which passes through a pipe, a pyrometer, an instrument for taking distances at sea and a sea-lead for taking soundings. He died at New York on March 8, 1889. By his own wish he was buried at his birthplace, a Swedish war-vessel coming to escort his body home, which was sent by the United States government in the man-of-war *Baltimore.* A statue is to be erected to his memory at Stockholm. See *Life* by W. C. Church.

JOHN ERICSSON

Erie, Pennsylvania, county-seat of Erie County, is situated on Lake Erie. It is the only lake-port of the state, and has the best harbor on Lake Erie, five miles in length and protected by a breakwater four miles long. It occupies the site of Fort Presque Isle, an old French fort, and is about halfway between Cleveland and Buffalo. Its lake-trade is large, consisting mainly of lumber, iron-ore, coal and petroleum. It has factories of stoves, steam-engines, car-wheels, bricks, leather, organs, pumps, brass-foundries, several oil-refineries breweries, etc. It is supplied with water from the lake, which is pumped to a tower 251 feet high, said to be the highest water-pipe in the world. The government-building, city-hall, St. Vincent's Hospital, Hamot Hospital, U. S. Marine Hospital, Home for the Friendless, Union Depot, opera-house and soldiers' home are among its chief buildings. Near the city is a memorial in the form of a blockhouse, in honor of Anthony Wayne, erected by the state. The city has excellent public schools, a public library, three national and several savings-banks, daily and weekly newspapers and natural gas. It was laid out in 1795, and became a city in 1851. Population, 66,525.

Erie Canal. See CANAL.

Erie, Fort, was situated in Welland County, Ont., on Niagara River, almost opposite the present site of Buffalo. It was captured by General Brown at the head of a column of 6,000 Americans on July 3, 1814, the garrison consisting of 170 soldiers and volunteers, and evacuated by them on Nov. 5. It was unsuccessfully assaulted by General Drummond on Aug. 15, the accidental explosion of a powder chest nearly annihilating the storming party.

Erie (*ē'rĭ*), **Lake,** one of the five great lakes of North America which empty into the St. Lawrence River. Ohio, Pennsylvania and New York are on its southern shore, Canada on the northern one and Michigan on its western. It receives the waters of Lakes Superior, Michigan and Huron through the Detroit River, and discharges them through the Niagara River into Lake Ontario. It is 240 miles long and from 30 to 60 broad, its entire area being 9,600 square miles. At its southwestern end are several islands, some of which are cultivated and are noted for their vineyards. It is the shallowest of the five great lakes, and this, with the small number of good harbors, makes navigation dangerous and difficult. The chief harbors are Buffalo, Erie, Dunkirk, Cleveland, Sandusky and Toledo. It is connected with Lake Ontario by the Welland Canal, with the Hudson by the Erie Canal and with the Ohio by the Ohio and the Miami Canals. It receives no large rivers. A naval battle under Commodore Perry was fought with the British on the lake, Sept. 10, 1813. The victory is commemorated by a monument at Cleveland, O., and by a stone on the island of Gibraltar, near the spot of the engagement.

Eritrea (*ā-rē-trā'a*), an Italian colony on the Red Sea, extending from Cape Kasar to Cape Dumeirah on the Strait of Bab-el-Mandeb. It is bounded on the north and west by the Egyptian Sudan. Abyssinia bounds it on the south and west, and French Somaliland on the southeast (see ABYSSINIA). Its coast-line is 670 miles long, its area about 88,500 square miles, and its population, nearly all nomadic, estimated at 450,000. It is self-governing, and has the management of its own finances. Asmara is the seat of government; Massawah the principal town, with 2,275 inhabitants. Gold has been found near the latter town. Irrigation works are required for agriculture, but pasture is abundant.

A railway is projected from Asmara to Massawah, of which 48 miles are open. There are telegraph lines from Massawah to Perim by way of Assab and from Massawah to Addis Abeba.

Erl-king. See FAIRY.

Ermine (*ĕr′mĭn*) or **Stoat,** an animal of the same class as the weasel and mink. It has a slender body, about ten inches long, and short legs. In summer it is a reddish-brown color with yellowish-white fur underneath; but in winter it changes to a beautiful white, all except the tail, which always remains black. It is a quick, restless, brave and bloodthirsty animal, runs swiftly and climbs and swims well. It makes its home among rocks and stones, and feeds on smaller animals, such as birds, rats, mice and chickens, sucking the blood of each of its prey. It is found in Europe as far south as the Alps and in Asia and America. The ermine-fur used in trade is the white fur with the black tails inserted in regular order. It was formerly used in the linings of the robes of kings and queens and other high officials, but is not so popular now. The best furs are imported from Siberia, Lapland and the Hudson Bay territories.

Erskine (*ĕr′skĭn*), **Thomas, Lord,** a British orator and jurist, was born on Jan. 21, 1750. He was sent to sea against his will, entering the navy in 1764. On his return he studied law at Cambridge, England, and was admitted to the bar in 1775. In his first case he made a wonderful plea, which at once gave him high rank as a lawyer. He was elected to Parliament in 1783 and 1790, but his speeches in Parliament never equaled his efforts as a lawyer. He held the offices of attorney-general and chancellor to the Prince of Wales. This last position he lost by his defense of Thomas Paine. He was made Baron Erskine in 1806, and died on Nov. 17, 1823. He published several pamphlets, a romance, a few poems and *View of the Causes and Consequences of the War with France*, which ran through 48 editions. His reputation, however, rests entirely on his speeches as a lawyer, and in this respect he is unrivaled in the history of the English bar. See Campbell's *Lives of the Chancellors*.

Erzerum (*ĕrz′rōōm′*), a town and vilayet in Armenia, Asiatic Turkey, on the west branch of the Euphrates, is on a plain 6,200 feet above the sea and surrounded by mountains. The streets are crooked, narrow and dirty. The houses are built of volcanic stone cemented with mud. The city with its four suburbs has 40 mosques, a number of large bazars and a few fine buildings, with many ruins of former magnificent structures. The principal trades are tanning, dyeing morocco leather and blacksmiths' and coppersmiths' work. Its copper and iron wares are widely known. It was captured by the Russians in 1829 and 1878. It is now a Turkish city. It is the residence of English, Russian, German and French consuls. Population, 38,900. See Curzon's *Armenia*.

Esarhaddon (*ē-sär-had′on*), an Assyrian king, was the son of Sennacherib and his successor. He reigned from 680 to 668 B. C. He held his court alternately at Nineveh and at Babylon, being the only king of Assyria who ruled over Babylonia during his entire reign. His conquests extended as far as Cyprus and through a large part of Media. He was the first Assyrian king to invade Egypt, and was called king of Egypt and Ethiopia. He also conquered Judæa, carrying its king, Manasseh, captive to Babylon.

E′sau, also called Edom, the eldest son of Isaac and twin brother of Jacob, was the ancestor of the Edomites, an ancient people inhabiting Mt. Seir. He was a wild hunter, rash, passionate and generous, and no match for his crafty brother Jacob. When hungry from a long hunt, he sold Jacob his birthright as the elder son for a mess of pottage; but his anger, when he realized what he had done, was so great that Jacob fled into Mesopotamia. Esau met his brother, however, on his return from his long exile, and was reconciled to him.

Escalator, a device often called a moving staircase, is a means of carrying people from level to level by means of a system of moving trucks which are bolted to a chain connected with a driving-wheel. The trucks have the appearance of a series of steps. At top and bottom the trucks are of the same level, so that there is practically a platform which gives passengers sufficient time to step off the escalator. A curved railing, fitted with moving belts, gently shunts them off if they do not move. An example of such an escalator may be seen at the 125th St. subway station, New York City. When desired, it may be used as an ordinary staircase.

Escanaba (*ĕs′kȧ-nạ′bȧ*), county-seat of Delta County, Mich., 52 miles northwest of Marinette. It is on Little Bay de Nouquette, an inlet of Green Bay, and has passenger and freight-steamer connection with all the leading ports on the Great Lakes. It is important as an iron-shipping point, having five docks for iron-ore and a large one for other products, and, besides, is in the center of a vegetable, grain and lumber-region. The city has a good public-school system, a high-school, a public library, St. Joseph's high-school and a national bank. It is served by the C. & N. W. and the M. & St. P. railways. Population, 13,194.

Escurial (*es-kū̆'ri-al*) or **Escorial** (*ĕs-kō'-rĭ-al*), a monastery, royal palace and burial place of the Spanish kings, situated 31 miles northwest of Madrid, on the slope of the Sierra Guadarrama, 3,700 feet above the sea. It was built by Philip II, and dedicated to St. Lawrence in memory of a victory which occurred on St. Lawrence's day. The main building is 706 feet long and 550 broad. A smaller square building, used as the royal palace, projects from the east side. It was begun in 1563 and finished in 1584. It held one of the finest collections of pictures in Europe until 1837, when a hundred of the best were taken to Madrid. The burial place of the royal family, called the Pantheon, is an eight-sided room beneath the church. The kings of Spain, from Charles V to Alfonso XII, all but Philip V and Ferdinand II, are buried here in marble tombs, placed one above another in niches in the wall. The Escorial was much injured by fire in 1872.

Esdraelon (*ĕs'drȧ'ē-lŏn*) or **Plain of Jezreel,** a valley in Palestine, extending along the River Kishon from Mt. Hermon to Mt. Carmel. It is a fertile plain, and is in the shape of a triangle, its longest side measuring 18 miles in length. Here Gideon defeated the Midianites, and in 1799 the French under Napoleon conquered the Turks. As late as 1867 the plain was annually overrun and wasted by the Arabs, but is now in a high state of cultivation. See *Haifa*, by Laurence Oliphant.

Eskimo (*ĕs'kĭ-mô*) or **Esquimaux,** a people numbering about 40,000, who are spread over the most northern parts of America, the Arctic Islands, Greenland and about 400 miles of the nearest coast of Asia. They have been found as far north as discoverers have gone, living usually within 20 miles of the seashore. They are the most thinly scattered people in the world. They seem to be allied to the American Indians, being about the same height, with slightly brown skin and coarse, black hair. They live by hunting and fishing, the seal furnishing them with food, clothes and fuel. Their houses are built of wood or stone (covered with sod) or of snow, with a funnel-shaped, half-underground passage for an entrance. The rooms are heated by lamps, and the sleeping places, somewhat like stalls, are arranged in rows along the sides, with often 50 and sometimes 200 inmates to a house. Men and women wear the same dress—a pair of trousers and a coat or sack, with a hood attached to draw up over the head, made of skins. The women use the hood as a cradle for carrying their children. The Eskimos are divided into tribes, and the tribes again into groups, while one of the oldest and most respected men is obeyed as chief of a house or wintering-place. The Eskimo of Labrador, southern Alaska and western Greenland are Christians. The name is supposed to come from an Indian word, meaning eaters of raw meat. Their name for themselves is Inuit or, in Greenland, Kaladlit. See *The Eskimo Tribes*, by Dr. H. Rink.

Esperanto, an artificial language invented by a Russian scholar named Zamenhof and first given to the public in 1887. It is designed to meet the requirements of a universal language. It seems necessary that any language to be universally adopted must be an artificial one, since national jealousy prevents the adoption of a living language, as English or French. A great advantage would necessarily be given to any nation whose language was thus universally adopted. On the other hand, the adoption of a dead language like Latin is out of the question, as it is too difficult for general acquisition. Esperanto is claimed to be very easy to learn for any person familiar with any one of the main European languages, as its vocabulary is made up of only such words as are common, though in varying forms, to the main languages of Europe.

Esquimault (*ĕs-kwī'ma̤lt*). The western suburb of the city of Victoria (British Columbia). Until recently it was the headquarters of the North Pacific fleet. The ships, save one or two, have been withdrawn and the Dominion has undertaken the maintenance of the fortifications, which are amongst the strongest in the empire. Esquimault has a splendid harbor. It was formerly used exclusively by the navy, but will now be opened to merchant-vessels. There is, besides, a dockyard with a huge dry-dock. Barracks and a naval arsenal complete the equipment of the place, which is heavily fortified.

Essay (The). The essay, as a record of individual observation and personal comment on social life, was first elaborated in France by Michel de Montaigne. His book, published in 1580, has never been excelled in keen penetration, rich knowledge of life, sound judgment and frank and genial conversational comment. Lord Bacon's essays, published in 1597, are rather more like addresses or treatises in their formality; although they are brief, like letters, and pithy, like proverbs. With the rise of the periodicals, the form attained its best English expression in *The Tatler* and *The Spectator* of Steele and Addison. These brief sketches of the aspects of contemporary and local life, in their endeavor to correct some of the minor faults of the times, added certain characteristics from ancient fable and satire, and thus anticipated the manner of much of modern political and social humor. They also embodied their experiences and observations in fictitious characters, such as Sir Roger de Coverley, thus aiding in the development of the novel and the short story. They also elaborated the criticism of history and politics, of religion and morals, of literature, art and the drama, so that these have since been regarded as separate provinces, which leave the familiar essay of to-day to apply its casual, personal and suggestive method chiefly to social manners, fashions and humors. This narrowed form has continued to flourish in England, through Goldsmith, Lamb, Thackeray and Stevenson down to the present. Literary criticism in essay form is illustrated by Coleridge, Hazlitt and Matthew Arnold in England, Sainte-Beuve in France and Lowell and Whipple in America.

In the United States, Washington Irving imported the method of humor and satire in his *Salmagundi* (1807) and the general form of the essay in his *Sketch-book* (1819). The latter contains autobiographical matter; sketches of places, things, manners and customs; studies of national and racial traits; literary criticism; tales of sentiment; and tales of mystery, like *Rip Van Winkle.* In variety of content it thus is a precursor of the magazine of to-day. Among other American essayists, Emerson deals chiefly with religion and morals, Poe and Lowell with literature. Dr. Holmes, in *The Autocrat of the Breakfast-Table,* modified the form in the direction of table-talk. Thoreau's *Walden* revived the nature essay. The tradition of Steele, Addison and Irving was continued, almost unchanged, by George William Curtis and Charles Dudley Warner.

Es'sen, a town of Prussia, 21 miles from Düsseldorf. It is situated in a rich coal and iron district, and has large manufactures of iron, tobacco, canes and vinegar, with dye works and breweries. It is known as the site of the celebrated Krupp gun-works and cannon-foundries, one of the largest establishments in the world. These works have 1,195 furnaces, 92 steam hammers, 286 boilers and 370 steam engines; they use 2,735 tons of coal and coke daily, and produce nearly 600 tons of iron a day. They employ over 20,000 workmen. The water-supply is brought by an aqueduct four miles in length. The town dates back to 873, and has an old church founded in that year. It was ruled until 1803 by the abbess of the Benedictine nunnery, who ranked as a princess of the empire. It was transferred to Prussia in 1803. Population, 294,629.

Es'sex, Robert Devereux, Earl of, was born on Nov. 10, 1567. His first service was in the Netherlands under the Earl of Leicester, his stepfather. At court he became a favorite of the queen, and was put in command of the forces sent to help Henry IV against the League in 1591. To him was largely due the capture of Cadiz (1596). He quarreled with the queen about an appointment, turning his back upon her in the presence of her ministers, and, when she resented the indignity with a box on the ear, drew his sword, swearing that he would not endure such treatment from Henry VIII himself. They were never really reconciled. After failing as lord-lieutenant of Ireland, he formed a wild scheme to get rid of Elizabeth's councilors, who were opposed to him. He entered London at the head of 300 men, expecting the people to rise in his favor, but was disappointed and forced to surrender. He was tried for treason, condemned, and beheaded on Feb. 25, 1601. Elizabeth was very unwilling to sign his death warrant, but the story of the ring given him by the queen for a safeguard and kept back by the countess of Nottingham, is now believed to be an invention. He was a writer of verse, built a monument to Spenser, and gave an estate to Bacon.

Esther (*ĕs'ter*) (a star), the Persian name of the Jewish maiden Hadassah. She was the foster-daughter of Mordecai, one of the officers of the Persian king, Ahasuerus, and was selected by the king as his wife instead of Vashti, who had refused to present herself to the king and his courtiers in the midst of a drunken revel. The king's prime minister, Haman, out of jealousy toward Mordecai, had persuaded the king to issue a decree for the destruction of the Jews. But through the influence of Esther, acting under Mordecai's direction, Haman was hanged, Mordecai was made chief in his place, and another decree issued permitting the Jews to destroy their enemies. The story is found in *Esther.* The Jews still observe the feast of Purim in memory of this event, and the whole book of *Esther,* called by them *The Roll,* is read in their synagogues on that day.

Ether, a medium of exceedingly great tenuity supposed to fill all known space, including that which we speak of as filled with ordinary matter. The necessity of such a medium was first recognized by Huygens, and was admitted by all other clear thinkers as soon as Römer discovered the fact that light travels with finite speed. For, when it has been shown that light requires eight minutes to travel from the sun to the earth, the query naturally arises as to what becomes of the light (*i. e.* luminous energy) between the time it leaves the sun and the time it reaches the earth. The simplest possible explanation is that it exists somewhere in the space between the sun and the earth. But in all our experience we have never found energy except as associated with matter. For the sake of simplicity, therefore, we may assume that in this case, also, that is, in free space—space devoid of ordinary matter—luminous energy is also associated with matter. We call this matter ether. Since, however, in the 2,000 years between the time of Hipparchus and the present we are unable to detect any certain change in the length of the year, and since no retarding effect seems to be exerted upon any of the other planets, we must assume that the ether is a medium of enormously less density than the most tenuous gas of which we know anything whatever. Kelvin estimates the density of ether as $9.36\text{x}10^{-19}$. Huygens, Young and Fresnel have proved, not only that light is a wave-motion, but that it consists of a transverse wave-motion. But transverse waves are possible only in a medium which possesses rigidity, *i. e.*, in a solid medium. We are driven therefore to assume further that the ether is a *solid;* or, at least, that it behaves as a solid for motions as rapid as those which constitute light. Shoemakers' wax is very brittle, as may be shown by striking it a quick blow with a hammer; but, if a hammer be laid upon a pan of shoemakers' wax and allowed to remain, it will be observed that at the end of some days the hammer has sunk to the bottom of the wax, showing that the wax behaves as a fluid with regard to slow-acting forces. The ether may behave as a fluid with respect to the comparatively slow motion of the planets through it.

In 1864 Maxwell predicted, and in 1888 Hertz proved experimentally, that electrical disturbances are propagated through space with the same speed as that of light. In other words, they proved that one and the same medium would answer for the propagation of light waves and electric waves.

Melloni and others had already proved that the laws of propagation of heat are identical with those of light. The cumulative evidence for thinking space filled with a ponderable medium of exceedingly minute density grows stronger every day. For the original suggestion of the modern ether, see Huygens' *Treatise on Light*, translated in Harper's *Scientific Memoirs.*

Ethics is the theory of conduct, so far as conduct may be judged as right and wrong. Ethics, then, means little more than morals. But the study of ethics may include that part of the theory of life which is involved in the explanation of the causes and effects of moral acts and the moral judgment.

The chief question which divides students of ethics is whether there be one unchangeable highest good, a *summum bonum,* or whether there be only *goods.* In a given set of circumstances, is there only one right or good mode of action? Or is it merely that one mode of action is more right, is better, than another? The same difficulty exists for the true and the beautiful. Are the true, the beautiful and the good fixed and absolute; or do they depend upon the use which is made of them and upon what a man carries with him to the thing that he judges? For if the good, the beautiful and the true are fixed and perfect, then ethics, like logic and the study of art, will take its place as a branch of philosophy. It will depend upon the reconstruction of experience as a whole. But if there be only goods, not good; truths, not truth; things beautiful, not beauty; then ethics may only be studied as a science. Its study will be the study of what has been judged good and bad and what is being judged good and bad; together with the natural grounds of the moral view that is taken in each case. The philosophical school of ethics tries to set up an ideal of good and thus a standard of right and wrong conduct; the scientific school seeks to content itself with facts alone.

Yet it may be possible to think of the ends or aims or goods of life as belonging to a system; so that there may be one ideal highest good, and yet within the system many goods. The system will be a growing and organic one, incomplete and unfinished, yet seeking perfection. Thus tragedy and the clash of right with right may be no more than a mode of the growth of the highest good. In this event, ethics may be both a philosophy and a science. The study of conduct as it exists is a science; the study of conduct as it tends to become is a philosophy.

But may ethics be only an art, and neither a science nor a philosophy? No; civilization affords no example of the practice of conduct without a theory. Ethics is indeed an art; but it cannot be merely an art. It must be grounded upon facts or else upon ideals. Clearly facts, or things done, and ideals, or things aimed at, both should have part and lot in ethics. Facts are nothing without values; ideals are idle and empty without facts. Therefore the student of ethics may do well to study writers of both types, scientific and philosophical. On the side of ethics as a science, he may begin with the *Data of Ethics* of Herbert Spencer; and on the side of philosophy with the *Prolegomena to Ethics* of the late T. H. Green. A lucid introductory work, like Mackenzie's *Manual of Ethics,* might precede these.

Upon the whole, the history of ethics has centered about the search for the standard of right and wrong, good and evil. Is pleasure the highest good? If so, whose pleasure? Is the highest good, as for Kant, duty? Or is it, as for Bentham and Mill, the greatest good of the greatest number? Is it to serve others, or to realize the possibilities of the self? Green held it to be the realization of the self in a common good. Others hold that the standard is present utility; the future must take care of itself. To the believer in progress, there is an ideal eternal good; but because this is only *becoming*, there also is a temporary present good. These goods may clash; but only for the moment. According to this view, principles of ethics may hold good in general, but not rigidly; they may concede something to the moment, but beware lest they concede too much.

Ethio'pia (the Cush of the Bible), the name given to the countries south of Egypt and Libya, on the upper Nile. It included modern Nubia, Sennaar, Kordofan and Abyssinia. The name Ethiopian was originally given to all the nations inhabiting the southern part of the globe, or, rather, to all people of a dark-brown or black color. The word is supposed to come from two Greek words meaning sun-burned. The part of Ethiopia of which we have the most ancient knowledge is the kingdom of Meroë, an island formed by two rivers tributary to the Nile. Its capital was Napata. The island was very fertile, with an abundance of animals and metals. It also was the site of an oracle of Jupiter Ammon. This made it a great place of resort and a trading place for India, Arabia, Egypt, Libya and Carthage, so that it grew rapidly and became, about 1000 B. C., one of the most powerful kingdoms of the ancient world. It threw off the yoke of Egypt about 760, and in turn ruled Egypt for sixty years. At one time 240,000 Egyptians settled in Meroë, and, being artisans and traders, added to its prosperity. It was conquered by Cambyses about 530 B. C. The Ethiopians sent to Darius every third year four pints of gold-dust, 200 logs of ebony, five negro slaves and 20 tusks of ivory. Augustus conquered Meroë, and we find Queen Candace (Candace means the queen) of Ethiopia mentioned among his vassals. The remains of the ancient civilization of Ethiopia are the ruins of large buildings covered with sculptures representing battles and religious ceremonies, rows of broken sphinxes, temples hewn in the rocks and several pyramids, which are higher in proportion to their base than those of Egypt. The names of 30 kings and queens have been found, the first one, named Meneliheh, being said to be the son of Solomon and the queen of Sheba. The modern history of the country belongs to Abyssinia. The area is over 400,000 square miles, with an estimated population of over 5,000,000. See ABYSSINIA and NUBIA.

Ethnology. See RACES.

Et'na or **Ætna,** a volcano on the eastern coast of Sicily, 10,850 feet high. It ends in a single cone, with a crater 1,000 feet deep and from two to three miles around. On the sides of the mountain are a large number of smaller cones, the chief being the Monti Rossi, twin peaks cast up in the eruption of 1669. The mountain rises through three zones—the cultivated region, of about 2,000 feet, where date-palms, bananas, oranges, lemons, olives, figs and almonds are grown; the wooded region in the middle, planted with forests of chestnut, cork, beech, pine, maple and oak; and the desert region beginning at about 6,300 feet from the base of the mountain, a dreary waste of black lava, ashes and sand, covered through a large part of the year with snow. The famous chestnut-tree, one of the largest and oldest trees in the world, formed by seven trees grown together and 163 feet in circumference, is in the wooded region of the slope. Nine thousand and seventy-five feet above the sea an observatory was built in 1880, which is the highest inhabited house in Europe, being 1,000 feet higher than the shelter on the Great St. Bernard. The earliest recorded eruption of Mount Etna has no date, but seems to have happened before the Trojan War. The earliest date is 475 B. C. The most remarkable eruptions are the following: In 1169, when Catania with 15,000 citizens was destroyed; 1329, when a new crater was opened; 1444, when the cone fell into the crater; 1537, which overwhelmed two villages; 1669, when a chasm 12 miles long was opened and a new crater made. In 1852–53 there was an eruption, which lasted nine months and sent out a torrent of lava six miles long, two miles wide and 12 feet deep. There have been in all about 100 eruptions, 16 of them occurring in the 19th century. The ascent is usually made from Catania. See *Etna and Its Eruptions*, by Rodwell.

MOUNT ETNA AS SEEN FROM REGGIO IN CALABRIA

Eton College, a famous English school, situated in Eton, on the Thames, 22 miles from London. It was founded in 1440 by Henry VI. The governing body is nominated by the Universities of Oxford and Cambridge. Several scholarships at King's College, Cambridge, are filled every year by Eton scholars. The students number nearly 900. Bolingbroke, Canning, Chatham, Fielding, Fox, Hallam, Gray, Shelley, Wellington and Gladstone are on the list of its scholars. The buildings, of brick and stone, date from 1440 to 1889. The Gothic chapel is especially beautiful. The "montem," a procession of the students, which took place three times a year to Salt Hill, was one of the features of the school until 1846, when it was stopped. The boys marched to the hill, led by a captain, and spent the day, partaking of breakfast and dinner on the hill. They were visited by crowds of spectators, from whom they collected toll, called "salt," which amounted often to $5,000. See Maxwell Lyte's *History of Eton College*.

Etruria (*ē-trōō'rĭ-ȧ*) a division of ancient Italy, west of the Tiber and the Apennines and including the valley of the Arno. At one time it included also the valley of the Po and a region south of the Tiber. Modern Tuscany and some neighboring countries (part of Umbria) cover about the same region. Etruria proper was a union of 12 cities or cantons, each of which was independent. Veii, 11 miles from Rome and her rival for four centuries, covering 16 square miles and destroyed by Camillus in 396 B. C.; Cære, where is the tomb of the Tarquins, now the village of Cervetri; Cortona, perched upon a rock, the most ancient site in Italy; Tarquinii, 60 miles from Rome, now partly occupied by the town Corneto; Clusium; Perusia, now Perugia; and Volsinii, a once powerful city and one of the last to yield to Rome, are among the names of Etruscan cities that have come down to us. Etruria is represented as a powerful and wealthy state before Rome was founded. According to tradition, the Etruscan era commenced in 1044 B. C., nearly three centuries before that of Rome. With the beginning of history we find the Etruscans a great naval power, ruling over northern and central Italy, Rome itself being included in its dominion and governed by Etruscan kings. The great sewer, the Cloaca Maxima, the Capitoline temple and the Servian wall are remains of Etruscan rule in Rome. Many of the state ceremonies of Rome were of Etruscan origin; also the circus, the combats of the gladiators, the horse races and the triumphal processions. The arrangement of the houses, the building of aqueducts and sewers and the position of woman in the family can all be traced to the Etruscans. For a century after the overthrow of the Etruscan kings in Rome, Veii kept up a varying struggle. In 538 B. C. the Etruscans, with the Carthaginians, sent a formidable fleet to expel the Greek colonists from Corsica. They attacked the Greek colony of Cumæ in 525 B. C. and again in 474 B. C., when their naval power was shattered in a great battle, the first event of Etruscan history of which we possess a record of the time. In 476 B. C. the Etruscans were the greatest military power in Italy, but soon after that time they began rapidly to decline. The Samnites, Greeks, Gauls and Romans hastened the downfall of Etruria. In 280 B. C. the Romans reached Volaterræ, the northern stronghold of the Etruscans, and the long struggle of five centuries came to an end. The Etruscan cities kept their wealth and power as partly independent allies of Rome for a time. They gradually, however, became Roman cities, adopting Roman customs, and were finally admitted to the Roman empire in 89 B. C., while the great Etruscan families held leading positions in Rome.

The people of Etruria were called Etrusci by the Romans and Tyrrheni by the Greeks. They were a short, sturdy race, with large heads, thick arms, high color and black hair; a people so unlike the other Europeans, that Seneca said: "Asia claims the Etruscans as her own." Their origin is, however, unknown. From their monuments we learn that they had an extensive literature, composed of histories, poems and dramas; but their books have perished, and our only means of learning anything of their language is from inscriptions, of which there have been about 5,000 discovered. They excelled in medicine, astronomy, mining, metal-working and the building of roads and tunnels. The bronze statues of Etruria were famous; they filled the temples of Rome, and it is said that the city of Volsinii alone had 2,000 of them. The Chimæra, in the museum at Florence, and the wolf in the capitol at Rome and a magnificent lamp at Cortona are still preserved. The painted vases found in Etruscan tombs are probably of Greek workmanship. The tombs of the Etruscans were of two kinds, the stone-pyramid, with rooms, and the chamber cut in the rock. They were furnished, as their houses were, having chairs and vases, mirrors, pottery and jewelry, and the walls were decorated with scenes from their daily life or from the underworld. See *Cities and Cemeteries of Etruria*, by Dennis.

Eubœa (*ū-bē'ȧ*) is a long and narrow island on the eastern coast of Greece, separated from the mainland by a narrow channel. The island is fertile; indeed in the Greek its name signifies *rich in cattle*. Cattle, wool, hides, cheese, oil, milk and honey are the chief products. The island has passed during historic times under the control of the Athenians, Macedonians, Romans, Turks and modern Greeks. In ancient times, when not dominated by Athens or Macedon, Eubœa was shared among seven city-states, of which the chief were Eretria and Chalcis. It now has a population of over 100,000.

Eucalyp'tus. A genus of the myrtle family, containing about 140 species, which are known in general as gum-trees. The species are all natives of the Australasian region, excepting a few which belong to the East Indies. They are mostly trees, and sometimes are of great size, commonly rising from over 100 feet to more than 400 feet in height. The wood is very durable and much used in Australia. The name gum-tree has been given because the bark of certain species yields a resin from which tannin is obtained in commercial quantities. *E. globulus* has come under wide cultivation, being often planted in swamps and malarial regions, which it is said to assist in draining and rendering more healthful.

Euclid (*ū'klĭd*), a mathematician, the Father of Geometry, was a Greek, born at Alexandria in Egypt and living about 300 B. C. Very little of his life is known except that he taught mathematics in the reign of Ptolemy I, who died in 283 B. C. He probably was the founder of the illustrious mathematical school at Alexandria. When Ptolemy asked him if there were not an easier way of learning geometry, he made the celebrated answer: "There is no royal road to geometry." His principal work is the *Elements*, in 13 books, portions of which are used in schools as a text-book of elementary geometry. It has been translated into many languages, and is probably better known than any other mathematical work. The first printed edition was translated from Arabic in 1482. It is still in use as a text-book in Great Britain. Besides the *Elements*, Euclid wrote the *Data*, a collection of 100 propositions in geometry, a book much valued by Newton, and *Phænomena* or appearances of the heavens. See *Euclid and His Modern Rivals*, by C. L. Dodgson.

Eugène (*ū-jēn'*), **François, Prince,** called Prince Eugène of Savoy, was one of the greatest generals of his time. He was born at Paris, Oct. 18, 1663. Louis XIV refused him a commission in the army, and he entered the service of the emperor of Austria. He rose rapidly in rank, becoming field-marshal in 1693. He defeated the Turks in the battle of Zenta, Sept. 11, 1697, which ended their power in Hungary. The War of the Spanish Succession, in 1701, found him in command of the Italian army, but his force was too small to achieve very much. As commander of the imperial army of Germany, he helped Marlborough to gain the victory of Blenheim (1704), and later he shared in the glory of the fields of Oudenarde (1708) and Malplaquet (1709). In the war against the Turks, in 1716, Eugène, with 64,000 men, defeated an army of 150,000, and in 1717 carried Belgrade by assault, receiving in the bloody struggle his 13th wound. In times of peace he was prominent in the councils of the nation at Vienna, where he died on April 21, 1736. He was worshiped by his soldiers and has since been regarded as a hero in popular song. He served under three emperors, and used to say that in Leopold I he had a father, in Joseph I a brother and in Charles VI a master. See *Prince Eugène of Savoy*, by Malleson.

Eugènie (*ẽ'zhâ-nẽ'*), **Marie de Montijo,** ex-empress of France, was born at Granada, Spain, May 5, 1826, of Spanish and Scotch descent. Her beauty won Napoleon III, emperor of France, to whom she was married in 1853. A wedding present, in value about $12,000, from Paris, she used in endowing a college for women, and also gave to charities $20,000 out of her husband's gift. She made a voyage to Venice, Constantinople and Egypt, and was present at the opening of the Suez Canal. She was made regent when Napoleon was at the head of the army in 1870. When the news of his surrender at Sedan reached her, she fled after midnight with a few attendants, to England, where she was afterward joined by her son and husband. Her only son, Napoléon Eugène, was born on March 16, 1856, and was killed in the Zulu War in 1879.

Euphrates (*û-frā'tēz*), the largest river of western Asia, rises in the heart of Armenia and flows south, breaking through the Taurus Mountains in a succession of rapids and cataracts for about 40 miles. At Kurna the Tigris joins it, and with the new name of Shatt-el-Arab it empties itself by several arms into the Persian Gulf, 1,700 miles from its source. It is navigable for small boats nearly 1,200 miles, and warships can ascend it for 120 miles. In ancient times, by a system of canals and embankments, the river was used for irrigating the country as the Nile is in Egypt; but the works are not kept up. The Euphrates is mentioned in the Bible as one of the four rivers of the Garden of Eden. It is called the "great river." The city of Babylon was situated on its banks, and Nebuchadrezzar had locks and dikes made to enable large vessels to ascend it as far as the city. See *The Euphrates Expedition*, by W. F. Ainsworth.

Eureka, Cal., county-seat of Humboldt County, 225 miles northwest of San Francisco. It is located in the famous redwood region, and its lumber interests are important. Near the city is Sequoia Park, a 40-acre tract of redwood forest. The city has good schools, newspapers, gas and electric light and the service of three railroads. It is situated on Eel River and Humboldt Bay, and has a fine harbor, which the U. S. government has improved. Population, 11,845.

Euripides (*ū-rĭp′ĭ-dēz*), a famous Greek poet, was born in Salamis in 480 B. C. He was the last of the three great tragic poets of Greece. He was a pupil of Anaxagoras and a friend of Socrates. His first play was written when he was 18. He is said to have written from 75 to 90 dramas, of which we have 18 complete. *Alcestis*, *Medea*, *Hecuba*, *Andromache*, *Ion*, *Orestes*, *Iphigenia*, *Electra* and *The Bacchæ* are some of his works. Socrates admired his tragedies so much that he always went to the theater if a play of Euripides was performed, but Aristophanes made fun of him and charged him with degrading tragedy by introducing in it scenes from every-day life. He left Athens for the court of Archelaus, king of Macedon, where he died in 406 B. C. When the news of his death reached Athens, the whole city was plunged in mourning. Sophocles, then 90 years old, made his actors wear mourning on the stage. The Athenians asked for the body of Euripides for burial, and when refused built a magnificent tomb to his memory on the road to the Piræus, with the inscription: "All Greece is the monument of Euripides. Macedonian earth covers but his bones." Archelaus also built a monument, and inscribed upon it: "Never, O Euripides, will thy memory be forgotten." His popularity increased after his death. His plays were much oftener revived on the stage than those of Sophocles or Æschylus. His works were favorites of Aristotle, Vergil, Ovid, Horace, Milton and Browning.

Europe is, historically and politically, the most important of the five great divisions of the world, though, next to Australia, the smallest in size, and is also the most densely populated. There have been several theories as to the origin of the name Europe. The old mythological one was that it was from Europa, who was carried off by Zeus; another that it came from *Eurus*, the southwest wind; and still another, that it means *Broad Land.* The latest suggestion is that the name was first given by the Phœnician traders from the word *Erebh*, meaning darkness, and applied to the country as the land of sunset or the west.

Geography. Europe has a total length, from Cape St. Vincent on the southwest to the mouth of Kara River on the northeast, of 3,400 miles, and is 2,400 miles broad from North Cape in Norway to Cape Matapan, the most southern point of Greece. Not including islands, the area of the continent is 3,800,000 square miles, being about one third that of Africa, a fourth of America and a fifth of Asia—not much exceeding the total area of the United States. Its indented coast-line, caused by its great irregularity and the number of deep inlets and gulfs, is more extensive, in proportion to its size, than that of either of the other great natural divisions of the globe, being about 40,000 miles. It is divided physically into two great portions—the great plain in the northeast and the highlands from near the center toward the southwest; the mountainous peninsula of Scandinavia lying apart from both. The plain occupies about two thirds (2,500,000 square miles) of the entire continent, reaching from the eastern boundary north to the Arctic Ocean, south to the Caucasus and Black Sea and westward over the whole extent of the continent, gradually narrowing as it approaches its western limit. Its shape is triangular, the base resting on the eastern boundary and the apex on the shores of Holland. It separates the two mountain systems of Europe —the Scandinavian on the north (highest summit 7,566 feet) and the Pyrenees, Alps, Carpathian, Balkan and Caucasus ranges on the south. The mass of the Alps, with an area of nearly 100,000 square miles, forms the center of the mountain system of southern and western Europe, stretching down on the four sides toward France, Germany, Hungary and Italy, the highest summit being 15,732 feet. The other mountain ranges are the Pyrenees, 11,170 feet; Carpathians, 8,343; Balkans, 9,750; Apennines, 9,574; and the Sierra Nevada, 11,660; and in Sicily, Etna, 10,850 feet. The observatory on Etna (9,075 feet) is, since 1882, the highest inhabited spot in Europe, being nearly 1,000 feet higher than the celebrated hospice on the Great St. Bernard. Europe is surrounded by water on three sides. The White Sea enters from the Arctic Ocean; the German Ocean and the Mediterranean Sea enter from the Atlantic. Scandinavia in the north and Spain, Italy, Greece, Turkey and the Crimea in the south are the most important peninsulas. Excepting Iceland, the islands closely cluster around the mainland, the chief being Great Britain and Ireland, Nova Zembla, Sardinia, Corsica and Crete (Candia) The lakes are small as compared with America or Africa. The largest rivers are the Volga, 1,977 miles; Danube, 1,740; Ural, 1,450; Don, 1,125; Kama, 1,055; Petchora, 975; and the Rhine, 765.

Countries of Europe	Area in sq. miles	Population
Andorra	175	5,231
Austria-Hungary	241,333	49,418,598
Belgium	11,373	6,693,548
Bosnia-Herzegovina	19,800	1,895,673
Britain, United Kingdom	121,391	45,469,564
Bulgaria	38,080	4,284,844
Crete	3,330	310,403
Denmark (with the Färoes)	15,592	2,605,268
France	207,054	39,376,000
German Empire	208,780 (1910)	64,903,423

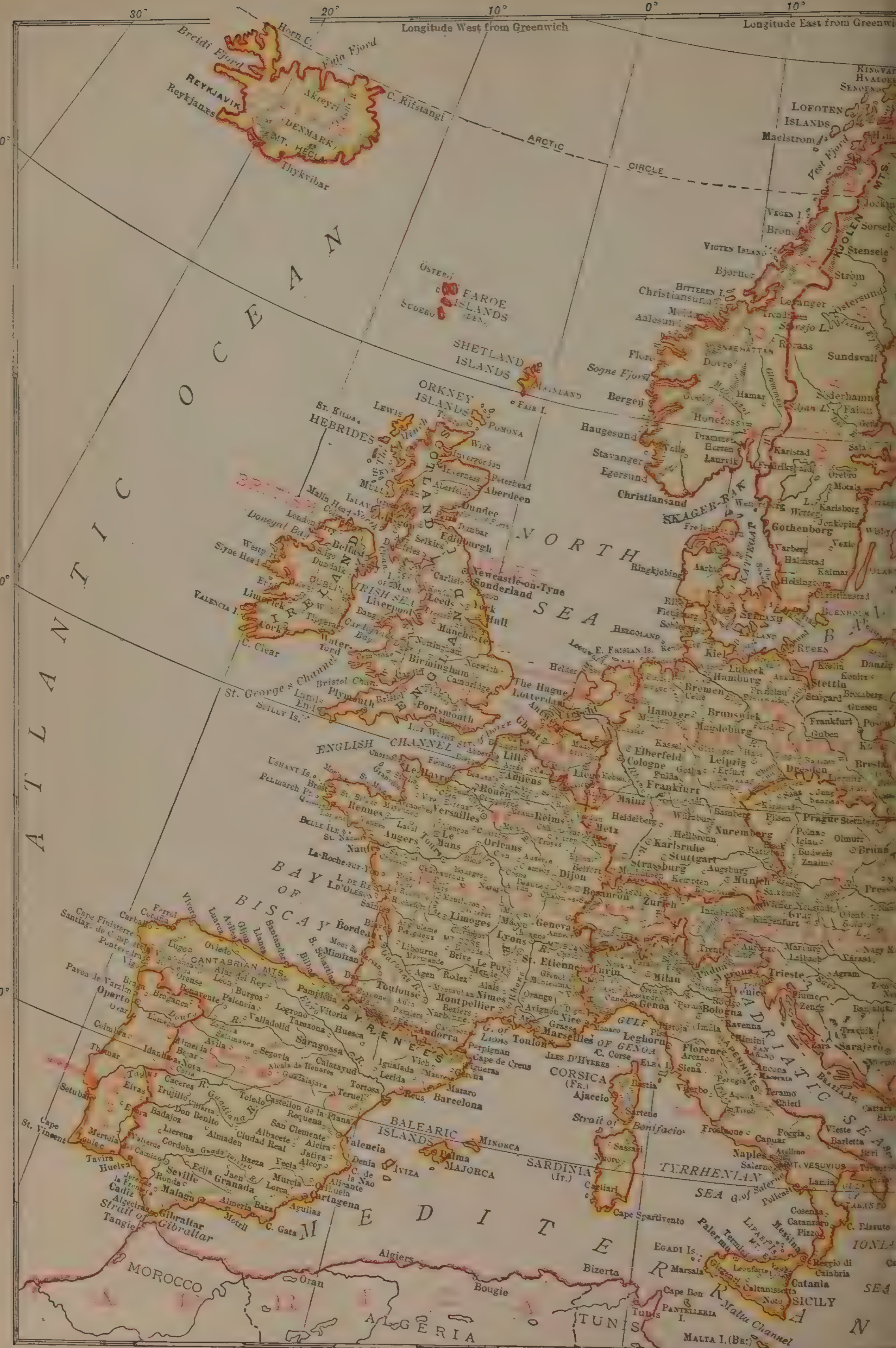
Countries of Europe	Area in sq. miles	Population
Greece	25,014 (1909)	2,666,000
Italy	110,550 (1910)	34,565,198
Lichenstein Principality	65	9,650
Luxemberg (Grand Duchy)	998	246,455
Monaco, Principality of	8	19,121
Montenegro	3,630	250,000
Netherlands, The	12,648 (1909)	5,898,429
Norway	124,129	2,392,698
Portugal (and Madeira and Azores)	35,490	5,423,137
Rumania	50,700	6,500,000
Russia in Europe (including Finland)	2,122,527	119,521,200
San Marino	38	10,489
Servia	18,650	2,492,882
Spain	194,783	19,503,068
Sweden	172,876	5,476,441
Switzerland	15,976	3,741,971
Turkey in Europe	65,350	6,130,200

Natural History. The natural history of Europe agrees very much with that of the same latitudes of Asia. The climate of the larger part is temperate, though parts of Sweden, Norway and Russia lie within the arctic circle; and portions of Spain, Sicily and Greece are about 12 degrees from the northern tropic. The temperature of western and northern Europe is raised by the Gulf Stream, the winds from the dry desert land in Africa and the large amount of moisture from the Atlantic above that found elsewhere in similar latitudes. The effect is so great that the northern limit of some plants is later reached on the Atlantic shores than in the more central parts of Europe, where the winters are much colder and the average temperature of the year is lower. Plants which require a mild winter will not grow in the north and scarcely even in the center of Europe; but they advance along the western coast under the influence of the ocean climate. The myrtle, though not native, grows in the south of England, the date-palm in the south of Europe; and among animals a species of ape is found on the rock of Gibraltar, while some strictly African birds are frequent visitors; and many birds, such as the swallow, cuckoo etc. are common to Europe and Africa, migrating in summer to northern regions and returning in winter to the warm south. Many of the plants found in the south of Europe have probably originally been brought from Africa or the east—the myrtle, vine, olive, orange, lemon, fig, peach, almond, apricot etc. are instances; while some are certainly natives of Europe, as, for example, the apple, pear, plum and cherry. Among the wild animals at the present time the bison is still reckoned, and the ox at no very remote period. The reindeer inhabits the extreme north, while the elk, stag, fallow-deer and roebuck are found further south; the ibex exists on the high central mountains; and there are two species of antelope, the Alpine chamois and the saiga of the Russian plains. Other animals are the civet, ichneumon, muskrat, porcupine, bear, fox, lynx and wolf. The fisheries of the European seas are valuable, more particularly the herring and cod in the north and the tunney, anchovy etc. in the Mediterranean.

Races. The European races mainly belong to the various branches of the great Aryan stock, though in few of the countries is there a pure race. Generally speaking, Celtic blood is most largely found in France, in the northern part of Great Britain and in Ireland. Teutonic peoples occupy Germany, Switzerland, the Netherlands, part of Belgium, part of Austria, Denmark, Norway, Sweden, Iceland and Great Britain. Slavonic races are found in Austria, Prussia, the Balkan peninsula and Russia. Romanic language and blood are prominent in Italy, France, Spain, Portugal and Rumania. The Greeks belong to the same branch of Aryans as the Italians. The non-Aryan peoples are the Finns, Lapps and Samoyeds of the north and northeast, various Turanian tribes in the east of Russia, the Hungarians, Turks and the Basques of the Pyrenees. The total population is nearly 442,000,000—giving an average of about 116 to each square mile. The best method of classifying the races comprising this grand total is language. Using this test, we find some 108,000,000 of Europeans are Teutonic; over 95,000,000 Slavs (Russian, Polish, Czech, Croat, Serb, Slovak, Slavonian and Bulgarian); nearly 100,000,000 Romance-speaking peoples (French, Italian, Spanish, Portuguese, Rumanian, Walloon, Rhætian); 3,000,000 Letts and Lithuanians; 5,250,000 Greeks and Albanians; 4,739,569 Celtic (Welsh, Breton, Irish, Gaelic, Manx); 1,050,000 Armenians, Ossetians and Gypsies. Some 18,000,000 are non-Aryan (Magyars, Finns, Ugrians, Tartars, Turks, Kalmucks, Basques, Circassians, etc. and Maltese). Upward of 50 languages are spoken in Europe.

Religions. In religion, Europeans are largely Christians, though there are Buddhist Kalmucks in southern Russia and pagans among the Lapps, Finns, Samoyeds and Tcheremisses. The Turks, many Albanians and some Russian Tartars and Slavs are Mohammedans (6,629,000). There are 6,456,000 Jews. The Roman Catholic church has 160,165,000 adherents, the Greek church 89,196,000, while the various Protestant churches include about 80,812,000.

The early history of Europe is that of Rome, Greece and the Byzantine empire, (which see). On the death of Theodosius (395 B. C.) the Roman empire was divided finally into two parts: the Latin empire or Empire of the West, with Rome as its capital; and the Greek empire or Empire of the East, the capital of which was at Constantinople. Beyond the boundaries of the Roman world was a great barbaric people, divided into two


Longitude West from Greenwich
Longitude East from Greenwich
30°
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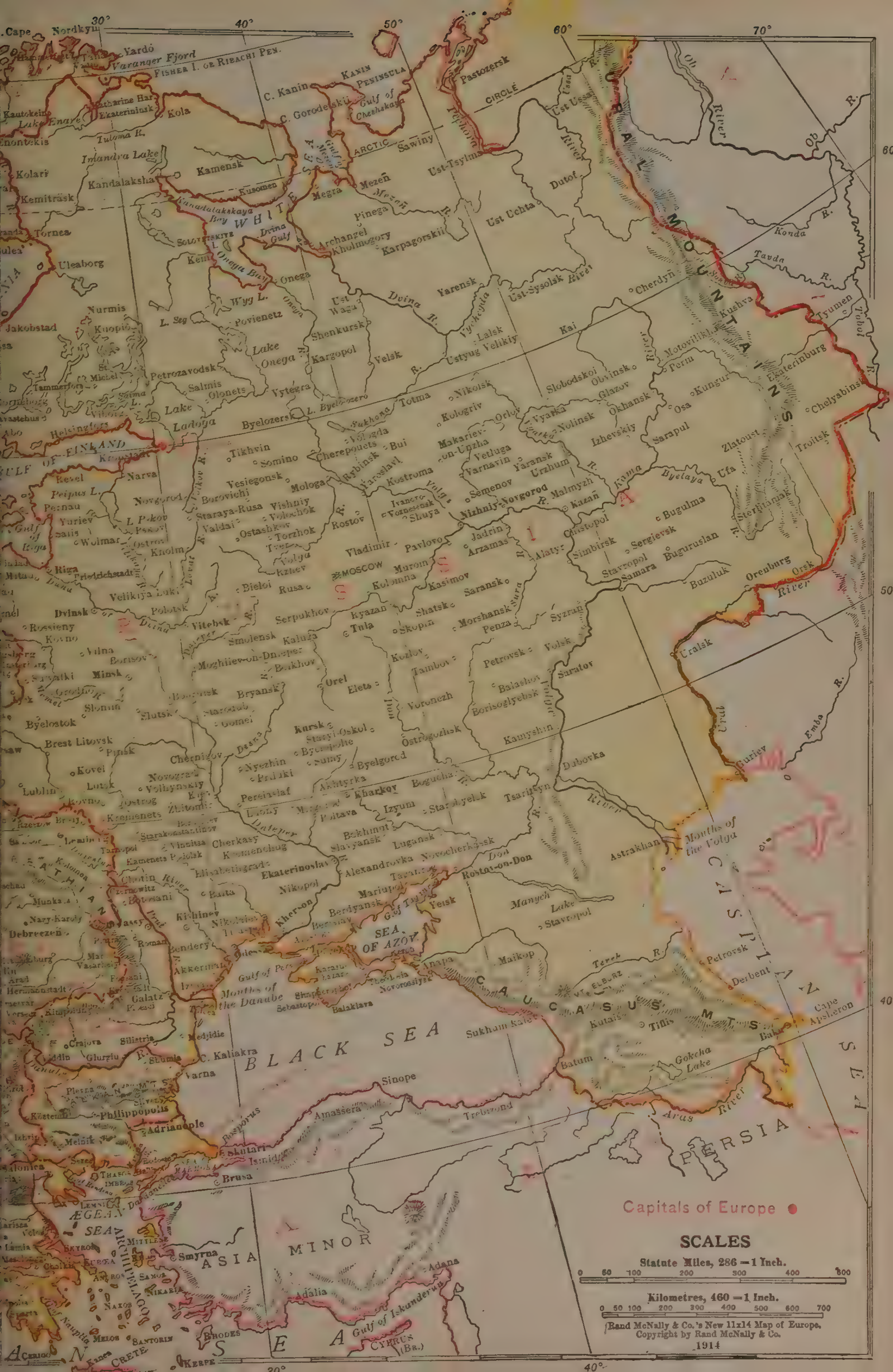
ATLANTIC OCEAN
NORTH SEA
BAY OF BISCAY
ENGLISH CHANNEL
IRISH SEA
MEDITERRANEAN
TYRRHENIAN SEA
ADRIATIC SEA
ARCTIC CIRCLE
Horn C.
Breidi Fjord
Eyja Fjord
C. Rifstangi
REYKJAVIK
Reykjanæs
Akreyri
(DENMARK)
MT. HECLA
Thykvibar
FAROE ISLANDS
SHETLAND ISLANDS
ORKNEY ISLANDS
POMONA
Fair I.
HEBRIDES
St. Kilda
Lewis
SCOTLAND
Wick
Inverness
Aberdeen
Peterhead
Dundee
Edinburgh
Glasgow
Newcastle-on-Tyne
Sunderland
York
Leeds
Hull
Manchester
Liverpool
Birmingham
Cambridge
Norwich
Bristol
Cardiff
Plymouth
Portsmouth
Land's End
Scilly Is.
St. George's Channel
Bristol Chan.
IRELAND
Belfast
Londonderry
Donegal Bay
Sligo
Dundalk
DUBLIN
Limerick
Cork
Waterford
Valencia I.
C. Clear
Malin Head
Slyne Head
Isle of Man
Carlisle
Selkirk
Dumfries
Mull
Skye
Islay
NORWAY
Christiansund
Aalesund
Bergen
Haugesund
Stavanger
Egersund
Christiansand
Sogne Fjord
Dovre
Hamar
Hønefoss
Drammen
Laurvik
Trondhjem
Roraas
Namsos
Bjørner
Vigten Islands
Vegen I.
Hitteren I.
Lofoten Islands
Maelstrom
Vest Fjord
KJOLEN MTS.
SWEDEN
Sundsvall
Söderhamn
Falun
Karlstad
Örebro
Motala
Karlsborg
Wetter
Jonkoping
Gothenburg
Varberg
Halmstad
Wexio
Kalmar
Helsingborg
Christianstad
SKAGER-RAK
KATTEGAT
DENMARK
Ringkjobing
Aarhus
Helgoland
Kiel
Lubeck
Hamburg
Bremen
Hanover
Brunswick
Magdeburg
Stettin
Danzig
Frankfurt
Guben
Breslau
Dresden
Leipzig
Kassel
Elberfeld
Cologne
Frankfurt
Mainz
Heidelberg
Würzburg
Nuremberg
Karlsruhe
Stuttgart
Strassburg
Augsburg
Munich
Metz
Prague
Pilsen
Brünn
Budweis
Zurich
Geneva
Innsbruck
Graz
Trieste
Agram
Fiume
Sarajevo
Holland
The Hague
Rotterdam
Amsterdam
Utrecht
Antwerp
Ghent
Liège
Lille
Amiens
Rouen
Havre
Cherbourg
Brest
Ushant Is.
Rennes
St. Nazaire
Nantes
Angers
Le Mans
Tours
Orleans
Versailles
Reims
Dijon
Besançon
Lyons
St. Etienne
Limoges
Bordeaux
Toulouse
Montpellier
Nimes
Marseilles
Toulon
Nice
Grenoble
La Rochelle
La-Roche-sur-Yon
Belle Ile
I. de Ré
I. d'Oléron
Bayonne
Perpignan
G. of Lions
Iles d'Hyères
CORSICA (Fr.)
Ajaccio
Bastia
C. Corse
Strait of Bonifacio
SARDINIA (It.)
Sassari
Cagliari
Cape Spartivento
Genoa
Gulf of Genoa
Leghorn
Turin
Milan
Verona
Padua
Venice
Bologna
Florence
Siena
Ravenna
Rimini
Ancona
Rome
Naples
Salerno
Mt. Vesuvius
Foggia
Barletta
Cosenza
Catanzaro
Messina
Reggio di Calabria
Palermo
Marsala
Catania
SICILY
Egadi Is.
Malta I. (Br.)
Malta Channel
Pantelleria I.
LIPARI IS.
APENNINES
Elba I.
SPAIN
Ferrol
Corunna
Cape Finisterre
Santiago de Compostela
Vigo
Lugo
Oviedo
Gijon
Santander
Bilbao
CANTABRIAN MTS.
Leon
Burgos
Valladolid
Salamanca
Segovia
Avila
Madrid
Toledo
Saragossa
Barcelona
Tarragona
Lerida
Huesca
Pamplona
Vitoria
PYRENEES
Andorra
Valencia
Alicante
Cartagena
Murcia
Granada
Malaga
Seville
Cordoba
Cadiz
Gibraltar
Strait of Gibraltar
Tangier
Almeria
C. Gata
BALEARIC ISLANDS
Majorca
Palma
Minorca
Iviza
PORTUGAL
Oporto
Coimbra
Lisbon
Setubal
Cape St. Vincent
Tavira
Badajoz
Huelva
MOROCCO
ALGERIA
TUNIS
Oran
Algiers
Bougie
Bizerta
Tunis
Cape Bon

1913



Rand McNally & Co.'s New 11x14 Map of Europe.
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1914

parts: the German or Teutonic, next to the western empire; and the Slavonic or Scythian, next to the eastern. The German barbarians were divided into tribes and nations: Goths, Burgundians, Alamanni, Vandals, Longobards, Franks, Angles, Saxons, etc. Farther away were the nomadic Alans. The Slavs, ancestors of the modern Russians, Poles and others, lived farther east and took small share in the history of the time. The Gothic tribes were mostly found in the region between the Vistula, Danube, Black Sea and the Don. This region was invaded by the Huns from Central Asia, and its inhabitants pushed westward, causing the great Gothic invasion. Gaul was overrun chiefly by Visigoths, Burgundians and Franks; Spain by Vandals, Suevi and Visigoths; Africa by Vandals, crossing from Spain. Italy suffered a number of invasions; and Britain, even before being abandoned by its Roman garrison, became as early as 367 a prey to Angles and Saxons. In the latter part of the 8th century the Frankish empire of Charlemagne extended from the Ebro to the Elbe and from the North Sea to Rome, the Franks having conquered both the Goths of France and the Burgundians. The two great divisions of Neustria (the kingdom of the west Franks) and Austrasia (the kingdom of the east Franks, Franconia, not at all corresponding to what was later known as Austria) became the starting-points of the kingdoms and nations of France and Germany. Where Hungary is now were the Avars, while to the east of the northern portions of the Frankish realms was the region of Slavonia. Nothing but the little kingdom of Asturia was left of the Gothic power in Spain; the rest formed the Moslem sultanate of Cordova, the Mohammedans having established themselves in Spain in 711. Most of England and part of Scotland were now occupied by the English or Anglo-Saxons. The eastern empire had considerably diminished. In the 12th century the kingdom of the east Franks was the successor of the western empire, known as the Germanic or Holy Roman empire, extending from the North Sea to the states of the church under the dominion of the popes. In southern Italy was the Norman kingdom of Sicily. Henry II of Anjou was king of England and lord of Normandy, Anjou, Brittany and Aquitaine; the remainder of France being a kingdom under the successor of the kings of the west Franks. In Spain the Christian kingdoms of Leon, Castile and Aragon were growing at the expense of the sultanate of Cordova. Poland and Russia became consolidated states, the heathen Prussians and Lithuanians being their northern neighbors. The Hungarians were in their present dominions; Bulgaria and Servia on the north still limited the decreasing Eastern empire, which on the east was threatened by the Seljuk Turks.

At the Reformation, in the 16th century, Charles V was not only emperor of Germany, but king of Spain (the Moslems having been driven out from their last strongholds in Granada), Sardinia, Sicily and Naples, and ruler of the Netherlands and the county of Burgundy. Ferdinand I, archduke of Austria and afterward emperor, obtained by marriage Silesia, Bohemia and a part of Hungary, the rest belonging to Turkey. At the end of the Thirty Years' War (1648) the power of the empire was weakened, while that of France increased, she having acquired most of the kingdom and duchy of Burgundy—she absorbed the country in 1674—and seized Strassburg and its territory in 1681. Savoy was becoming an Italian power. Spain still held the Spanish Netherlands and a great part of Italy. The Protestant Netherlands and Switzerland became independent states. Sweden was one of the great powers, having acquired territories from Germany, Poland and Russia. The ancient possessions of Denmark, in the northern peninsula, Sweden acquired in 1658. The duchy of Prussia became independent of Poland in 1647. Early in the 16th century Poland had been one of the most powerful states of Europe, a great part of Russia being under its sway. She now lost in power and territory, while Russia steadily grew. Turkey held part of the former Eastern empire, the Austrian princes the remainder. Venice was the most important native Italian power, and Genoa held Corsica till 1768.

Before the French Revolution Poland had ceased to exist as a state; Prussia had risen to greatness and Russia's territory had increased largely; while Sweden had lost the leadership of northern Europe. The Spanish Netherlands belonged to Austria since 1713; and French Bourbons held the parts of Italy that had been Spanish. The French Revolution began a series of changes ending in the extension of Napoleon's empire over Germany west of the Rhine, great parts of northern Germany, the Netherlands and most of Italy; a portion being directly united with the empire; another held separately by Napoleon himself as his kingdom of Italy; while his brother-in-law was king of Naples, and his brother king of Spain. After the fall of the empire France retired within her old limits; the smaller German princes formed a loose confederation, of which Austria assumed the presidency. Italy was parceled out among despotic princes, the Venetian dominions becoming Austrian. The Netherlands became once more a kingdom, but finally separated into Holland and Belgium.

The chief changes in Europe, since the middle of the 19th century, have been the union of German states in one empire, under the headship of Prussia, and the restoration to it of Alsace and Lorraine from France; the retirement of Austria out of Germany and her reorganization as the Austro-Hungarian monarchy; the forming of the Italian kingdom; and the gradual lessening of Turkish territory by the independence of Rumania, Servia, Montenegro and Bulgaria. Other recent features of interest in Europe have been the urgent demand in the chief countries for a reduction in national expenditures on armies and navies, accompanied by a simultaneous demand for the reference of all disputes, political and industrial, to arbitration. A further matter of interest has been the initiation of a permanent tribunal of arbitration at the Hague, Andrew Carnegie having generously offered to meet the cost of a great palace of peace to be erected there. Meanwhile, the nations have been engaged in furthering the educational, scientific, industrial and social progress of their respective peoples and in seeking to modify the socialistic trend of the times, while giving a beneficial turn to reform and the abatment of the current tendency towards revolution. See E. A. Freeman's *Historical Geography of Europe* and *Primer of the History of Europe.*

Eus'tis, James Biddle, American jurist, senator and ambassador, was born at New Orleans in August, 1834, graduated in law at Harvard (1854), and practiced in his native city. When the Civil War broke out, he entered the Confederate army and served as judge-advocate. From 1874 to 1876 he was a member of his state senate, and from 1876 to 1879 and again from 1885 to 1891 was a member of the United States senate. He also held the chair of professor of civil law in the University of Louisiana. During Mr. Cleveland's second term as president, Senator Eustis was minister and subsequently ambassador-extraordinary of the United States to France. In 1897 he resumed his legal practice at New York; but died two years later.

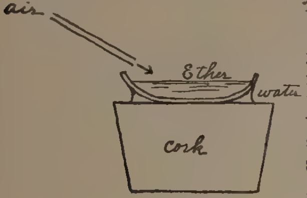
Evangeline, a beautiful pastoral poem published by Longfellow in 1847, deals with the loves of Evangeline and Gabriel. They are parted through the removal of the Acadians from Nova Scotia by the British government, and only meet many years later at the death-bed of Gabriel. The poem is written in hexameters; and is one of the most successful poems written in this style in English.

Evans, Rear-Admiral Robley Dunglison, was born in Floyd County, Va., Aug. 18, 1846, and was educated at the Naval Academy. He was first attached to the West India, and subsequently to the North Atlantic, squadron, and took part in January, 1865, in the attacks on Fort Fisher, in which he was twice wounded. He subsequently served on various cruisers, and was in command of the *Yorktown* at Valparaiso, Chile, during diplomatic disputes between that government and the United States. He later had command of the battleships *Indiana* and *Iowa*, and in the latter did excellent service in the bombardment of the forts of San Juan, Porto Rico, and took part (July 3, 1898) in the naval battle off Santiago de Cuba. He was made rear-admiral in 1901, was placed in command of the Asiatic fleet of the American navy, and in 1904 was assigned to the command of the Atlantic fleet. He was in command of the fleet of 16 battleships which sailed from Hampton Roads in Dec. 1907, passed around South America to the Pacific, and arrived at San Francisco in April of 1908. He was familiarly known to seamen as "Fighting Bob." He died Jan. 3, 1912.

REAR-ADMIRAL EVANS

Evanston, Ill., a rapidly progressing city in Cook County, on Lake Michigan, practically a suburb of Chicago, and lying 12 miles north of the City Hall. It is the seat of Northwestern University, connected with which is Cumnock School of Oratory. Swedish, Danish and Norwegian Theological schools and a public and a parochial system of education are maintained; also Garrett Biblical Institute. There are many attractive suburban residences of Chicago merchants, numerous churches and a delightful social life. Population 24,978.

Evansville, Indiana, capital of Vanderburg County, a railroad center and a port of entry on the Ohio, about halfway between Louisville and Cairo. It has a handsome post-office and custom-house, court-house, city-hall, public library and art-gallery, excellent schools and about 50 churches. Coal and iron ore abound in the vicinity, and the town has 400 factories, employing 11,000 workmen. These establishments produce plows, furniture, cotton and woolen goods, malt liquors, saddlery, harness, pottery, etc. Besides, the city has a large trade in tobacco, flour and other staples. Evansville is noted for its many flour-mills and large output; but especially for its extensive manufacture of the product of its great hardwood-lumber trade. Its commercial importance is aided by its central situation, which makes it the chief shipping point in southwestern Indiana. Population, 69,647.



EVAPORATOR

Evap'oration is the process by which a liquid body changes into a gaseous body. Whenever a vessel is only partly filled with a liquid substance, it is found that the remainder of this vessel always contains some of this substance in a gaseous form. This gas is called vapor. If the vessel be closed, it is found that, at any one temperature, this process of evaporation will go on until the vapor exerts a certain definite pressure—known as the vapor-tension of that substance at that temperature. What is very curious is that this vapor-tension is independent of any other gases that may be present over the liquid. It is not to be supposed that evaporation ceases when the vapor pressure reaches a maximum; but rather that, at this point, as many particles are leaving the vapor to enter the liquid as are leaving the liquid to enter the vapor. The rate at which evaporation proceeds depends very greatly upon the amount of vapor already present over the liquid. Accordingly, anything which diminishes the amount of vapor already over the liquid will increase the amount of evaporation. It is in this manner that a spoonful or tea may be cooled by blowing over it. For by blowing away the vapor we increase the evaporation. Since the average kinetic energy of a particle of vapor is very much greater than the average kinetic energy of a particle of liquid, it is clear that evaporation must rob the liquid of energy and thus cool it. If a watch-glass be placed on a cork with sulphuric ether on the glass and water underneath the glass, as shown in the figure, the water may be frozen almost immediately by simply blowing a steady stream of air over the surface of the ether. The vapor-tension of ether is high even at ordinary temperatures, so that evaporation is rapid. Since the latent heat of the vapor is derived from the heat in the ether, glass and water, the water is quickly frozen.

Another method of increasing evaporation is to increase the surface of the liquid. A pint of water in a large flat pan will evaporate much more rapidly than the same amount of water in an ordinary tin cup. Still another method of hastening evaporation is to place the liquid under the receiver of an air-pump and pump the vapor off. Strong sulphuric acid, which greedily absorbs water-vapor, will act in the same way. By combining these two methods (*i. e.*, placing both water and suphuric acid under the receiver of an air-pump) Leslie succeeded in freezing the water by evaporating it at the expense of its own heat.

Sometimes a solid evaporates directly without passing through the liquid state. Such a process is called sublimation. This is easily observed in the case of camphor and iodine. When a liquid is heated to the point where evaporation is no longer confined to the surface of the liquid but begins in the interior of the liquid, we call the process ebullition, or boiling. The temperature at which this occurs is called the boiling point. Evidently the boiling point may also be defined as that temperature at which the vapor-tension of a liquid is equal to the pressure of the atmosphere.

WILLIAM M. EVARTS.

Ev'arts, William Maxwell, American lawyer and statesman, was born at Boston, Feb. 6, 1818, and died at New York city, Feb. 28, 1901. He graduated at Yale, and was admitted to the New York bar in 1841, where he built up a notable practice,—receiving as high as $50,000 for an opinion in a case. He was chief counsel for President Johnson in the impeachment trial in 1868, and was United States attorney-general to the close of Johnson's administration. He was United States counsel before the Alabama tribunal in 1872, and senior counsel for Henry Ward Beecher in 1875. In 1877–81 he was secretary of state, and United States senator for the term 1885–91.

Ev'erest, Mt., a peak of the Himalayas, in Nepal, is the highest point yet found on the earth, rising to an elevation of 29,002 feet above the sea. It was named in honor of Sir George Everest, surveyor-general of India.

Ev'erett, Edward, American statesman and orator, was born at Dorchester, Mass., on April 11, 1794. He graduated at Harvard College with the highest honors at the age of 17, where he had been the principal editor of the *Harvard Lyceum*, one of the first college papers founded in the country. When but 19, he became pastor of Brattle Street Church at Boston. He was appointed professor of Greek at Harvard, took a two years' course of study at Göttingen University in preparation for it, and entered upon his work in 1819. He delivered a course of lectures in the university on Greek literature and art, which was so popular that he repeated them in Boston to large audiences. He wrote over 100 articles for the *North American Review*, of which he was editor for a few years. When he was elected to Congress, in 1824, his public life began. He served ten years, holding positions on important committees most of the time. From 1835 to 1839 he was governor of Massachusetts, and in 1840 was sent to England as minister of the United States. He secured for American seamen the right to fish in the Bay of Fundy, this being the first agreement between England and America on the subject of the fisheries. In 1845-48 he was president of Harvard College. He was secretary of the state for a few months, and again senator from Massachusetts for a short time, and was nominated for vice-president in 1860. His long course of public addresses and lectures, which made him so well known, began in 1824 with an address before the Phi Beta Kappa Society at Harvard College. In 1853 he prepared his address on *Washington* for the benefit of the Mount Vernon Association. It was delivered first before an immense audience in Boston, and repeated in different cities and states nearly 150 times. He also wrote a weekly article for the *New York Ledger*, realizing $10,000 for the benefit of the same association. Not including his expenses and his time, Mr. Everett gave $100,000 to the Mount Vernon fund. In 1863 he delivered an address at the dedication of the national cemetery at Gettysburg. He died at Boston, Mass., January 15, 1865.

Ev′erett, Mass., a flourishing city in Middlesex County, Mass., adjoining Boston and reached from it by a branch of the Boston and Maine Railroad and also by electric cars. Prior to 1870 it formed part of Malden, but in 1893 it was separately incorporated. It possesses good schools, churches and many fine residences of Boston merchants. Its industries include extensive chemical works, manufactories of rope, wheels, baby-carriages, and gas, coke and steel works. It also has two good public libraries. Population (which has increased rapidly in the past decade) 33,484.

Everett, Wash., the county-seat of Snohomish County, about 35 miles north of Seattle on Puget Sound. The surrounding region is an agricultural, lumbering and mining section. Among its leading industries are saw and paper mills, railroad and machine shops, shipyards and the manufacture of lumber products, etc. Everett has fine public schools and a public library, a hospital, and located here are the United States customs and assayer's offices. The city was settled in 1891, but its fine harbor and excellent railroad facilities have aided in its rapid growth to a substantial and modern city of about 30,000 population.

Ev′erglades. A large, shallow lake or marsh in southern Florida, 160 miles long and 60 broad. It incloses thousands of islets, which have a very rich soil and are covered with dense thickets, and contain great numbers of alligators. From this district Florida is sometimes called the Everglade State.

Evolution. Although evolution is a word in constant use, there still is great vagueness in the minds of most people as to what it stands for. In its broad sense it has come to mean the development of all nature from the past. If we think of the long train of events in the formation of the world and peopling it with life, we may look upon this story, figuratively, as written on a scroll that is being unrolled. Everything that has come to pass is on that part so far unrolled, and everything in the future is still covered but will appear in due course of time. Thus, evolution in its broadest sense may mean the unrolling of the scroll of the universe, including the formation of stars, solar systems and the elements of the inorganic world as well as of all living nature. But the word as usually employed is limited to organic evolution, or the formation of life upon our planet, and in this sense it is used throughout this article. It is a common mistake to suppose that Darwinism and evolution are the same, and there also is much misunderstanding as to the nature of the entire question. Hence we should first get a clear idea of what evolution is, then of the basis upon which it rests, and finally trace the growth of evolutionary thought, especially in the 19th century. Evolution, as used in biology, is a history of the steps by which animals and plants came to be what they are. The great variety of animals and plants is amazing. The water, the earth, the air teem with life; the fishes of the sea are almost innumerable; and in a single group of the insect world — the beetles — there are upwards of 50,000 species known and described. In addition to the living animals, there is entombed in the rocks a great multitude of forms that lived eons ago and became extinct. In view of all these forms the question comes at once to the mind: How shall we account for this great diversity of organic life? Have the great variety of forms existed unchanged from the days of their creation to the present, or have they, perchance, undergone modifications, so that one original form may have, through its descendants, emerged into different kinds? This is not merely an idle question, insoluble from the very nature of the case, for the present races of animals and plants have a long lineage reaching into the past, and it is a historical question to be answered by trying to discover their parentage. We shall see that there is good reason to believe that the higher animals have been derived gradually from simpler ones, including with the higher animals, also, the body of man. The very general acceptance of this view in the latter part of the 19th century, under the title of the doctrine of evolution, has made an epoch. It has had great influence, perhaps the greatest of any one doctrine, in modifying the point of view in many fields of thought. It is, therefore, so important that all intelligent people ought to know what the doctrine is. By way of clearing the ground it may be repeated that it is not a question of creation through Divine agencies or non-creation, but a question of method of creation. It is not a theological question, but an historical one. Nevertheless, when the doctrine arose with new force about 1860, it found itself in conflict with theological ideas and especially with the doctrine of creation called special creation. It is natural to think that the latter was a view held by the early theologians and Fathers of the church, but it is instructive to find that some of them, such as St. Augustine, openly expressed the opinion that God created all things "in the germ." The doctrine of special creation was introduced into English Protestant thought through the epics of John Milton, to whose forceful and picturesque language we have been indebted for many of our accepted dogmas, without having paused to examine into them.

The question of the parentage of animals involves the distant past. The very center of it is this: Are species fixed and permanent, as Linnæus, the great Swedish botanist and naturalist, supposed; or do they change? If it can be shown that species (or particular kinds of animals and plants) change so much as to be recognized as different kinds, then there has been evolution. If, on the other hand, the evidence shows that species are fixed, there has been no evolution. It is well-known that by cultivation we can produce varieties of flowers, and by breeding we can produce different kinds of pigeons, fowl, and stock. Therefore, living beings may change through changes in their surroundings. But we must bring the history of past ages to bear upon the question. Fortunately there are preserved in the rocks the petrified remains of animals, showing their history for many thousands of years, and we may use them to test the question. It is plain that rocks of a lower level were deposited before those that cover them. Now, in Slavonia we have some fresh-water lakes that have been drying up from geological times. All through the ages these waters were inhabited by snails, and the first formed ones were parents of the later broods. As the animals died, their shells fell to the bottom and were covered by mud and débris, and held there like currants in a pudding. In the course of ages these layers thickened and were changed into rock, and thereby we have shells preserved in their proper order of birth and life, the most ancient ones at the bottom and the newest at the top. We can sink a shaft or dig a trench, and collect the shells and preserve them in proper order. Those nearest the top are descended from those near the bottom, but are very different. No one would hesitate to name them different species, in fact naturalists made six or seven different species when these shells were first examined. If, however, the whole collection were laid out in a long row in proper order, while those at the ends would be very different, if we begin at one end and pass to the other, the shells all grade into one another by such slight changes that there is no line showing where one kind leaves off and another begins. This shows their history for thousands of years: The species have not remained constant, but have changed into other species. We have other examples of similar conditions in Württemberg, which show that shells may change not only into different species but into different genera so gradually that one cannot tell where to separate one kind absolutely from another. But we have more perfect and more remarkable series than those mentioned, involving higher animals. For example, there is contained in the rocks of our western states the complete history of the horse-family—written as it were on tablets of stone—and extending over a period of more than 2,000,000 years. Geologists can, of course, measure the thickness of rocks and form some estimate of the time it took to have them deposited, for the rocks that lie in layers or strata were deposited layer by layer, usually by water. In the deposits near the surface we can find remains of the immediate ancestors of the horse of to-day, and there is but little change. In lower rocks we can come upon the forms from which these were derived, and so on, as long as the record holds out. If in this way we go into the past a half-million years, we find the ancestors of the horse reduced in size and with three toes on the fore and hind feet. The horse has now only a single toe on each foot, but small splint-like bones that represent the rudiments of two more. If we go back 1,000,000 years, we find three toes and the rudiment of a fourth, and, going back 2,000,000 years, we find four fully developed toes and bones in the feet to support them. It is believed that in still older rocks a five-toed form will be discovered, which was the parent of the four-toed form. To sum up this evidence: The parentage of the horse is surely from animals with four (and possibly five) toes, not like the horse of the present day. Therefore, horses have been evolved, not originally created as we see them to-day. We have treated our question as an historical question, and have gone searching for clues in the past as an archæologist explores the past of buried cities, by digging, and collecting coins, implements, records, etc. and putting the facts together into a history. In the museums at Yale University are preserved upward of 30 steps or stages in the history of the horse-family, showing that it arose by evolution or gradual changes from a four or five-toed ancestor about the size of a fox and that it passed through many changes besides increase in size in the 2,000,000 years in which we can get facts as to its history. These facts, taken in connection with a multitude of others pointing in the same direction, give us the answer to the question: Were the immense number of living forms created just as we find them, or were they created by a process of evolution?

The series of shells and horses mentioned above are called evolutionary series. They were not known at the time of the publication of Darwin's great book on *The Origin of Species.*

The most interesting evidences of evolution bearing on all animal life are found in the various stages through which animals pass on their way from the egg to the fully formed animal. Every animal, above the Protozoa, begins its life as a single cell and passes through every gradation from that condition upward. As animals develop in this way, they become successively more and more complex, and many rudimentary organs arise and disappear. For example, in the young chick, developing within the hen's egg, there appear, after four days, gill-slits or openings into the throat, like the gills of lower fishes. These organs belong entirely to water-life, and are not of direct use to the chick. The heart and blood-vessels at this stage are also of the fish-like type, but all this disappears in a few days, long before the chicken is hatched. Similar gill-slits appear also very early in the development of the young rabbit and of all higher animals. The best way of explaining their presence — which certainly means something — is to say that they are inherited from remote parents. Animals in the course of their development repeat certain stages of their past histories. The presence of gill-clefts in the embryos of birds and rabbits probably means that both these animals sprang from ancestors that had gill-clefts, or water breathing animals. Such traces are like hieroglyphics and inscriptions on temples and columns — they are clues to ancient history and they weigh heavily on the side of evolution. If space permitted, the evidences in favor of evolution might be very much multiplied.

Having illustrated what the doctrine of evolution is, the main part of our task is done, for the questions regarding the different theories of evolution and the rise of evolutionary thought must be dealt with very briefly, and the reader directed to the best books for further information. The doctrine of evolution is regarded as established beyond controversy. The controversies about evolution to-day are not as to whether it was or was not the method of creation, but as to how evolution of different forms was brought about. Therefore we must distinguish between the facts of evolution and the factors. Although several theories have been advanced to account for evolution, only three command any particular amount of attention at the present time: those of Lamarck, Darwin and Weismann. Lamarck's theory was founded in the early part of the 19th century. Being greatly impressed with the differences produced in animal-life by surroundings — climate, temperature, moisture, elevation above the sealevel, etc., he came to believe that all variation in animals had been produced by different surroundings, and the effects of use and disuse of organs. The use of the muscles of the blacksmith's arm, for example, develops it greatly; the disuse of the wings of the wingless birds has led to the disappearance of their wings. The differences thus produced are inherited. While the explanation of Lamarck has two factors, that offered by Darwin has three. He showed that animals vary in a state of nature, that these variations are inherited and, thirdly, that nature selects the fittest to survive, through the failure and death of the weaker ones in the struggle for existence. The variations that prove of advantage to the individual would be the ones preserved and handed along by heredity. This theory was arrived at, independently, by A. R. Wallace, and should be known as the Darwin-Wallace theory of natural selection. But this is not evolution; it is an attempt to explain *how* evolution was brought about. Weismann's theory is difficult to state briefly and clearly. It is called the theory of continuity of the germ-plasm. He accepts Darwin's natural selection, and shows that the germ-plasm, or substance from which animals arise, is continuous from generation to generation. Heredity is explained in a simple way, viz., the offspring is like the parent, because some of the same stuff enters into all its cells. He concludes, further, that the germ-plasm must be impressed by surroundings before changes in the animal can be inherited. There is at present a disposition to revive Lamarck's ideas in a modified form and to unite them with Darwin's. The theory of Weismann is losing ground.

Let us now look briefly at the rise of the doctrine of evolution. Osborn has shown that there is a continuous train of thought along this line from the Greeks to Darwin, but modern evolution began at the close of the 18th century and did not fairly take hold of the minds of people till after 1859. Linnæus (1707–78), by defining species and giving them names that were adopted all over the world, directed the attention of naturalists to species, and thus made possible a consideration of the origin of species. He considered them fixed and unchanging. His contemporary, Buffon, gradually grew to the idea that the higher forms of life were derived by modifications from the lower ones. These views were warmly supported by Erasmus Darwin, the grandfather of Charles, and by the poet-naturalist Goethe. Lamarck, however, was the first fully to grasp the idea of evolution in its entirety. His book dealing with the subject (*Philosophie Zoologique*) was published in 1809, but his views were not accepted, largely on account of the opposition of Cuvier. They were shared by his friend Geoffroy St. Hilaire, and, after his death, a noteworthy public debate took place at Paris in 1830 between St. Hilaire and Cuvier on the question of organic evolution. Cuvier won by weight of authority and greater brilliancy. An important step in preparing the way for Darwin was taken by Charles Lyell in his *Principles of Geology* (1830), in which he showed that, if we would know what occurred in the past, we must observe the agents that produce changes in the present and read the past in terms of the present. Herbert Spencer in 1852 published a remarkable article on evolution, that came near anticipating Darwin. Wallace and Darwin arrived at the same explanation independently, and in July, 1858, their views were published together. Next year Darwin published his *Origin of Species.* This had a compelling power, and at once attracted wide attention, partly because the time was ripe, but mainly because he had a better explanation to offer than any previous thinker. The story of the conflict of the general theory with prejudice and dogma, and its final acceptance by the scientific world, philosophers and theologians is part of the history of the past 50 years. Huxley in England and Haeckel in Germany were especially active in promoting the ideas of Darwin. What to read on the doctrine of evolution is an important question, but one should not begin with Darwin's *Origin of Species*, because that is voluntarily to place oneself 50 years in the past. It is better to begin with a recent statement of the theory and then go back to Darwin's books. The following books are among the best: Romanes, *Darwin and after Darwin*, Vol. I.; Wallace, *Darwinism;* Fiske, *Destiny of Man;* Osborn, *From the Greeks to Darwin;* Darwin, *Origin of Species* and *Animals and Plants under Domestication;* Weismann, *The Germ-Plasm;* Romanes, *An Examination of Weismannism.*

Wm. A. Locy.

Ewell (*ū'ĕl*), **Richard Stoddert,** a Confederate general, was born at Georgetown, D. C. in 1817, served in Mexico and against the Apaches, and was actively engaged throughout the Civil War. In 1862 he distinguished himself under Jackson, losing a leg near Bull Run in August; and, having been promoted to lieutenant-general, he served gallantly at Winchester, Gettysburg and the Wilderness. At Sailor's Creek, however, he was captured, with his entire force, April 6, 1865. He died at Springfield, Tenn., Jan. 25, 1872.

GENERAL EWELL

Ewing (*ū'ing*), **Thomas,** an American statesman, was born in Virginia in 1789. He fitted himself for college by night-study while at work in the Kanawha salt-works. He graduated at Ohio University at Athens, O., receiving the first degree of A. B. ever given in that state. He was admitted to the bar in 1816, and was soon known as one of the first lawyers in Ohio. He was United States senator from 1831 to 1837, secretary of the treasury in 1841, and in 1849 he organized the newly-created department of the interior, returning afterward for a time to the senate. He was strongly opposed to slavery, voting against the fugitive-slave law and for the abolition of slavery in the District of Columbia. He introduced many improvements in the postal service. He died at Lancaster, O., on Oct. 26, 1871.

Excal'ibur, the sword of King Arthur, according to the legends, was given to the king by the Lady of the Lake, to whom it was to be restored at his death. Tennyson weaves a beautiful legend of how Sir Bedivere, being ordered by Arthur to cast the brand into the mere, twice hides the gleaming weapon before the reproaches of the king induce him to obey. A white hand caught the flying sword and drew it beneath the surface of the lake. See *The Passing of Arthur.*

Excursions, School. Out-door excursions with school-children for purposes of education have in recent years become a well-recognised mode of enlarging their ideas and range of experience. The main purposes of such excursions are to bring children in contact with the great outside world by direct experience and observation; and to give more reality to study;

make it less bookish and verbal; and make it more objective and concrete, more experimental.

All studies deserve to be based as far as possible upon direct experience. There, however, are certain studies which especially demand outdoor work and more or less extended excursions away from the school-house.

The chief classes of excursions may be stated thus:

1. Nature-study excursions. It is generally admitted that plants and flowers, birds and bees, butterflies, rocks and soils, field and country can best be seen and studied in their natural habitat. Books can not take the place of these outdoor conditions, and a close observation of these real objects in their relations to one another is the best kind of teaching.

2. In primary geography much of the work should be done out of doors, visiting the hills, valleys and streams of one's neighborhood, the shops and factories of one's native town, studying the commerce and shipping by wagons, railroads and by water, the construction of houses, the local political interests of the town and also the weather-conditions and changes of season. Children can not get these first experiences out of books, and the excursion is especially suitable to these topics in home geography.

3. Places of local historical interest are visited. Many neighborhoods have such spots, where the Indians lived, where the first settlers built, where the oldest buildings stand, where eminent men have lived or performed important deeds. Some towns have museums where old relics and mementoes of historical interest are preserved and may be seen by the children.

4. It is not unusual now to take children on a visit for a day or more to the state capital, the state university or some place of great scenic interest or to some large city, as Chicago or Cleveland, New York or San Francisco. The museums of fine arts in some of our cities are especially worthy of visitation by school-children, as the Metropolitan Museum in New York, the Art Institute in Chicago, the Carnegie Institute in Pittsburg, etc.

5. A visit to the city of Washington from those states near enough to allow it is of special interest for the purpose of seeing public buildings, monuments, etc.

Excursions have long been generally introduced into the schools of Germany. It is not unusual for a teacher in Germany to set off with a group of boys for a trip of two or three weeks through some interesting region, such as the Thuringian Forest, or the Harz Mountains, visiting famous scenic resorts, climbing mountains, seeing the places made famous by great men, cities and towns, churches and noted buildings, etc.

There are some serious difficulties to be considered in excursions with children. It is a great burden and responsibility to take charge of children upon such excursions. Most teachers prefer to keep children orderly in the school-house. It is expensive to transport children to any considerable distance in large cities by street-car or boat or by railroad. In visiting factories and shops certain dangers and interferences must be avoided.

In spite of these troubles and difficulties the advantages are so great that the tendency to extend the excursion is growing, and they are likely to be much more generally introduced in the future.

Many nature-study books suggest good excursions, as follows: *Field-Book of American Wild-Flowers* (Mathews); *Birds of Village and Field* (Merriam); *A Guide to Trees* (Lounsberry); *Life in Ponds and Streams* (Furneaux); *How to Read a Pebble* (Charles); *Outdoor Studies* (Needham); *Excursions and Lessons in Home-Geography* (McMurry); and *My Saturday with a Bird-Class* (Miller). C. A. McMurry.

Ex'eter, England, the capital of Devonshire, 171 miles from London, is "as good a specimen of an English county-town, at once prosperous in business and with a quiet air of aristocratic distinction, as can be found within the four seas." It is built on the summit and slopes of a flat ridge, rising 150 feet from the left bank of the Exe, and as a seat of commerce and industry has been left behind by many younger cities. Its woolen trade, once second only to that of Leeds, is a thing of the past, but it is yet the chief market of Honiton lace. It also has large nurseries and manufactures of gloves, agricultural implements, etc. A ship-canal extends five miles to the tideway. St. Peter's cathedral is a long, low edifice with massive towers. These towers are the original Norman ones (1112). The town has a picturesque guildhall (1464); while the Devon and Exeter hospital (1743), the lunatic asylum (1865) and the Albert Memorial Museum (1868) are the most noteworthy of modern buildings. It had a stormy time from 876, when it was captured by the Danes, down to 1688, when William of Orange entered it. The tragic burning of the new theater, Sept. 5, 1887, entailed a loss of 188 lives. See *Exeter*, by Freeman, in the Historic Towns Series. Population 48,660.

Exeter Hall is a large building situated on the Strand in London, England, completed in 1831. It will seat over 5,000 persons. It is rented chiefly for religious assemblies, and is in great request during the May meetings of religious societies. Many fine musical concerts have been given in it. In 1880 it was purchased for the Young Men's Christian Association for $100,000.

Explosives may be either mere mixtures, such as gunpowder, or chemical compounds, such as nitroglycerin. They may all be made to explode under sufficient heat; for example, dynamite or nitroglycerin at 180° C., blasting powder at 270°C. and rifle-powder at 270°C. The oldest of the explosives is gunpowder, which is a mixture of potassium nitrate, sulphur and charcoal, in some such proportion as 75 per cent., 10 per cent. and 15 per cent. respectively. The principle of explosives is to bring oxygen into very close contact with combustible substances. Thus even finely powdered wood-dust in the air may be an explosive. When the combustion is simultaneous, it is called detonation. The powerful explosive called guncotton, discovered in 1845, is made by treating cellulose with nitric acid. Guncotton is used in smokeless powder. Nitroglycerin, discovered in 1847, is made by treating glycerin with a mixture of nitric with sulphuric acid. Dynamite is made by combining nitroglycerin with an absorbent substance that prevents it from decomposing, as it would otherwise do. Explosives, chiefly for military use, are an important item of manufacture in the United States and the total value of these products increased from $10, 993,131 in 1890 to $40,139,661 in 1909.

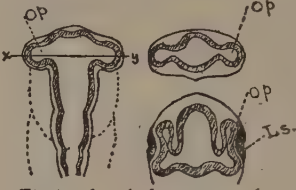
Expositions. National and international exhibitions or expositions of manufactures, arts, commerce, agriculture and mining are a feature of the present and the recent century. The first of any importance was held at Paris in 1798, and for half a century these displays were held every three years. In this, as in other things, Paris set the fashion. Between 1820 and 1850 exhibitions were held at Vienna, Berlin, Brussels, St. Petersburg, Stockholm, Moscow, Lisbon, Madrid, Dublin, Manchester, Leeds, Birmingham, New York, Philadelphia and many other cities. The first really national exposition in England was held in 1851 at the Crystal Palace, London; and the first of great importance in the United States was held in New York in 1853. The idea was also adopted in the east, and a large exposition was held at Constantinople in 1863. These great industrial shows had now become quite common events, and we need only mention as instances in the next few years the magnificent Paris Exposition of 1867 and the one at Vienna in 1873. The Philadelphia Centennial Exposition of 1876 was held in commemoration of the hundredth anniversary of American independence. Other recent expositions in this country have been those at Louisville in 1882 and at New Orleans in 1884. The Paris Exposition of 1878, which surpassed all others before it, was overshadowed by the Universal Exhibition of Paris in 1889. The Eiffel Tower (which see), wonderful as it was, was rivaled by the Machinery Palace, which had a span of 377 feet, but was without pillars or like support.

The World's Columbian Exposition, in Chicago in 1893, far exceeded all its predecessors. The opening of this century was marked by two industrial exhibitions of some magnitude and attractiveness, one at Glasgow, Scotland, and the Pan-American Exposition at Buffalo, N. Y. The design of the latter was to illustrate the progress of the age in science, arts and industries—especially those of the New World. The exposition also had for its object to promote trade among all American countries and to present a great object-lesson showing the industrial development of the continent. Part of its motive-power was obtained from the neighboring Falls of Niagara. The St. Louis or Louisiana-Purchase Exposition of 1903 was held to commemorate the centenary of Jefferson's purchase of the Louisiana territory; the Portland, Oregon, Exposition of 1905 memorialized Lewis and Clarke's successful conclusion of their exploration of the new acquisition; and the Jamestown, Virginia, Exposition celebrated the tercentenary of the founding of the first English colony in the present United States. Seattle, Washington, held an Alaskan Exposition in 1909. The Pan-American Exposition of the resources of the Americas at Buffalo in 1901, which was otherwise a brilliant success, was saddened by the assassination of President McKinley.

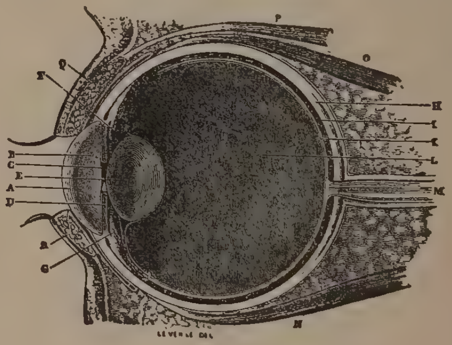
Express Companies. This is an American system organized for the speedy transmission of parcels or merchandise of any kind and their safe delivery in good condition. It began in the trip made from Boston to New York by William Frederick Harnden (1813–45), the first "express-package carrier," on March 4, 1839. The plan recommending itself to business men, competing companies sprang up rapidly, and express lines were established in all directions. Adams & Company's California express was started in 1849; Wells, Fargo & Company's in 1852; the American-European Company in 1855. As railroads extended, the early "pony express" disappeared, and individual companies made contracts with the railroad companies, their business over these routes being held to be entitled to the protection of the courts against any efforts to dispossess them. Many of the rival companies united, and now are joint-stock institutions, employing capital amounting to over $50,000,000. A feature of the system is the "collect on delivery" business—goods to strangers being marked C. O. D., with the amount to be collected, the express company making the collecting and forwarding "returns" to the shipper. Money-orders also are issued, payable at any of the numerous offices throughout the United States. They are received at banks from depositors, and are often preferred as cheaper and safer than checks or postal orders for small remittances by mail. See A. L. Stimson's *History of the Express Business.*

Extradition is the surrender of a prisoner accused of a crime by the government in whose dominions he has taken refuge to the government of which he is a subject, so that he may be punished or dealt with according to its laws for an offense committed within its jurisdiction. The crimes for which extradition may be demanded comprise murder, manslaughter, counterfeiting and forgery, embezzlement and larceny, obtaining money or goods on false pretenses, etc. Between this country and Great Britain the offenses number nearly 30 that are extraditable, though political offenses are excluded, as they usually are in all international treaties. Since the assassination of President Garfield provision has been made in the treaties of this country with foreign powers that attempts against the head of the state, in the way of assassination, murder or poisoning, shall not be deemed political offenses, and so they are extraditable. The rendition, in this country, of criminals or fugitives from justice from one state to another is provided for by the constitution; the state making demand for the return of the criminal paying the costs connected with the arrest and surrender of the person extradited.

Eyck (*īk*), **Hubert** and **Jan van,** two illustrious painters of the early Flemish school. They probably were born at Alden Eyck or Masseyck on the Maas, but the date of their birth is uncertain; Hubert is supposed to have been born about 1370 and Jan about 1389. The distinction of being the inventors of oilpainting is claimed for them, though evidence exists that it was practiced previously. But the Van Eycks were the first who brought into notice and perfected the mode of mixing colors with oil. For transparent and brilliant coloring and minute finish their works have never been surpassed. Jan seems to have been instructed in art by his elder brother and to have worked with him as court-painter to Philip of Charolais till 1422, when he entered the service of John of Bavaria, count of Holland, at The Hague; and in 1425 he was appointed painter to Philip the Good, Duke of Burgundy, practicing his art chiefly at Bruges. Hubert continued to reside in Ghent, and at the time of his death, Sept. 18, 1426, was engaged upon an important altarpiece, which was completed by Jan. The masterpieces of the brothers are mostly met with in Ghent, Bruges, Antwerp, Berlin, Munich and Paris. Three pictures of Jan's are in the National Gallery, London, dated 1432, '33 and '34. In the Louvre, Paris, is his exquisitely finished little picture of *Chancellor Rollin kneeling before the Virgin.* Jan died at Bruges on July 9, 1440. See *Early Flemish Painters* by Crowe and Cavalcaselle.



The head-end of a young embryo bird showing the formation of the optic vesicles (*op*) and the lens (L*s*). The figs. on the right are sections through the head.



THE EYE

Eye, the organ of sight. In some single-celled animals there is a colored spot sensitive to light, and from this simple condition to the complicated eye there are many gradations. In worms, insects and mollusks the eye develops from the surface-layer of cells by their becoming thickened and sometimes folded in. This is called a skin-eye. Nerve fibers grow from surface cells and pass to the brain. In the vertebrated animals the eye comes from a portion of the brain-wall, and has been called a brain-eye. But if the matter be looked at in an unprejudiced way, we shall see that the brain-wall at first was on the outside and, therefore, a portion of the surface layer of cells. The brain is formed by the rolling together of the outer layer of cells in such a way as to form a hollow tube, the walls of which become bulged out in several places, forming a row of enlargements or cavities. The eyes first appear as pockets or bulges (*op* in the illustration) from the front cavity of the brain; in this condition they are called optic vesicles. An optic vesicle is converted into an optic cup by changes best explained by reference to the illustration. The lens (*Ls*) is set free from the outer layer of cells and the wall of the original vesicle (*op*) becomes folded in to form a sort of cup, connected to the brain by a stalk. This is the beginning of the eyeball. The eyeball when fully formed consists of three coats: Sclerotic, the tough outer coat; choroid, the dark middle coat; and retina, the delicate inner coat about $\frac{1}{80}$ in. thick. The main cavity of the eyeball is filled with vitreous humor (see diagram); in front of that is the crystalline lens; and, still further forward, is a cavity containing aqueous humor. All of these are transparent. The sclerotic coat in front is transparent and bulges out into the cornea. The choroid coat bends down in front, as a sort of curtain, and forms the colored iris of the eye; this is perforated in front by a circular opening—the pupil of the eye. The iris has circular and also radiating muscle fibres, the contractions of which cause the pupil to vary in size according to the intensity of the light. The retina is a delicate, whitish coat of nervous material. It is very complex in structure, being composed of several sets of nervous structures arranged in layers. The outer ones are rods and cones, and the inner ones are large nerve cells. The optic nerve is made of fibers that spring from the retina and pass into the brain; it used to be supposed that the fiber of the optic nerve grew outward from the brain and spread out into the retina; it is now known that they begin their growth from nerve-cells in the retina and grow inward to the brain. The eyeball is a sort of camera with transparent lenses in front of the retina to focus light upon it. It can readily be shown that any lens, thicker in the center, will focus light on a screen in such a manner as to produce an image. If, for example, one stands by a window with a reading-glass and places a paper behind the glass at the proper distance, there will be an inverted picture of the landscape thrown on the paper by the lens. This is practically what occurs in the eye. The crystalline lens and other transparent parts in front of the retina focus light upon it and produce an inverted image; but it is the brain that does the seeing,—the eye is merely a receiving apparatus. The rays of light that strike the retina excite it to activity, and this is transmitted to the brain and brings about changes there which give rise to sight. Not all parts of the retina are equally sensitive to light. The yellow spot is the most sensitive; this lies in a line drawn directly through the center of the lens. It is a rounded, shallow depression, in which the retina is much thinner and is composed mostly of rods and cones. The remainder of the retina is sensitive to light, except the blind spot, which is the place where the fibers are gathered into the optic nerve. The rods and cones are the parts affected by the light—the fibers not at all. Therefore, in the optic nerve, which is composed entirely of these fibers, there is no activity set up by light; they are merely conductors of the effect produced on the rods and cones by the lght. The optic nerve is not connected with the eyeball symmetrically, but on the part nearer the nose, so that the blind spot is not in the center of the field of vision. The eyeball is moved by muscles—four straight ones and two oblique ones—so arranged that the eyeball may be turned up or down, to the right or left, and also slightly rotated. Certain defects in the eye are corrected by wearing glasses. When the lens is too rounding or the eyeball too long, the person is short-sighted; rays of light come to a focus before they reach the retina, and vision is hazy. This is corrected by concave glasses that tend to spread the rays of light. When the eyeball is too short, or the lens too flat, the person is long-sighted, and the rays of light come to a focus behind the retina. This is corrected by convex glasses that bring the rays of light to a focus earlier. The crystalline lens is capable of being changed to a limited degree. It is an elastic body, and is inclosed in a perfectly transparent membrane. Under ordinary conditions it is pressed upon and rendered slightly flatter than it would otherwise be; when the tension or pressure on it is reduced by the contraction of certain muscles within the eyeball, it bulges out more, and when the muscles return to their state of extension it is flattened again. The eye is accommodated in this way to clear vision for objects at different distances.

Eylau (*ī'lou*), 23 miles by rail south of Königsberg, has 3,546 inhabitants. Napoleon here encountered the allies—Russians and Prussians—under Bennigsen, Feb. 8, 1807. Darkness came on while the contest was still undecided; but, as Napoleon had a considerable force of fresh troops close at hand, the allies retired during the night upon Königsberg. Their loss was estimated at about 20,000; that of the French is set down at 10,000, but must have been much greater. The place is called Preussisch-Eylau, to distinguish it from Deutsch-Eylau, a town of 4,574 inhabitants, 89 miles north-east of Bromberg.

Eze'kiel (meaning God shall strengthen or Strength of God), one of the Hebrew prophets, was carried captive, when still a young man, along with Jehoiachin, king of Judah, to Mesopotamia by order of Nebuchadrezzar about 599 B.C. He was a member of the Jewish community which settled on the banks of the River Chebar, and first appeared as a prophet about 594, after the remarkable vision described in the opening chapters of *Ezekiel.* His career as a prophet extended over a period of 22 years. The date of his death is not recorded. *Ezekiel* was placed by the Jews among the "treasures," not to be read before the age of 30.

Ez'ra (Help), a Jewish scribe, lived about 450 B. C., and was regarded by the Jews of Christ's time as the second founder, with Nehemiah, of the Judean state. Judaism, as a religion, in distinction from the Hebrew religion before the captivity, dates from his day.

F

F (*ĕf*), the sixth letter, is a consonant. It is called a labio-dental surd, because it is made with the lips or, more commonly, with the lower lip against the upper teeth, and does not sound. It requires considerable breath to pronounce it, and gives a simple breath-sound, as in *fame*. The Spaniards and Greeks had great difficulty in pronouncing it. Its value comes from the Latin.

Fa'bius Max'imus, a member of one of the most illustrious patrician families of Rome. He was five times consul and twice censor, and was elected dictator immediately after the defeat of the Romans at Trasimenus. The tactics he observed in the second Punic War gave rise to what is now known as the Fabian policy in warfare. He avoided a direct engagement and harassed the enemy by guerilla warfare; he annoyed them by marches and counter-marches and cut off their stragglers and foragers; and during all this time his delay allowed Rome to assemble her forces in greater strength. He recovered Tarentum, one of Hannibal's strongholds. He died 203 B. C.

Factory and Factory-Legislation. It is not easy to set a date for the origin of factories. In England factories for wool were established in the reign of Edward III. But the nineteenth century was the great period of the rise of factories. This rise was the result of many new mechanical inventions, chief among which were those of Hargreave, Arkwright, Cartwright and Crompton. The factory-system of industry greatly increased the amount of production per man, but in bringing together great numbers of men, women and children it paved the way for the replacement of the old personal interest between master and workman by a mere cash-bond. Overwork and sweating became common practices. In England and America the first laws about factories dealt with the abuse of child and pauper-labor and with the lack of sanitary care within the factories, which became a fertile source of disease. The factory-system came later in America than in England. The English factories jealously guarded the secrets of their machinery. But in 1790 a factory for water-frame spinning was built in Rhode Island; and in 1803 the first cotton mill in America was built in Massachusetts. The growth of factories in America has continued with extraordinary rapidity.

The first modern factory-legislation in England was the law of Sir Robert Peel in 1802, dealing with the labor of children and paupers. A great number of acts followed, dealing with these and other problems. (See CHILD-LABOR ACTS.) In the United States, Massachusetts took the lead in labor-legislation; and the laws of the other states tend to be based on this code. But Australia and New Zealand have gone far beyond either England or America in limiting the hours of labor, the age of employees, the lowness of the wage that may be offered and the strife that is apt to occur from time to time between employers and employed, leading to wasteful strikes. But there are laws in the United States regulating the labor of women and children, sanitary matters, the soundness and safety of machinery, payment of wages, hours of labor (limited in Massachusetts to 58 hours a week for young people), hours of meals, licenses, etc.

Faed (*fād*), **Thomas,** a Scottish painter of renown, was born at Burley Mill, in Kirkcudbrightshire, Scotland, on June 8, 1826. He was made an associate of the Royal Scottish Academy in 1849, an associate of the Royal Academy in 1861, an Academician in 1864, and in 1875 was elected an honorary member of the Vienna Royal Academy. Among his celebrated pictures are *The Mitherless Bairn*, *The Last of the Clan* and *Scott and His Literary Friends at Abbotsford*.

Fahrenheit (*fä'ren-hīt*), **Gabriel Daniel,** the improver of the thermometer and barometer, was born at Dantzic, Prussia, on May 14, 1686. Originally intended for business, he abandoned trade at an early age and took up the study of natural philosophy. About 1714 he conceived the idea of using quicksilver instead of spirits of wine in the making of thermometers, thereby increasing their accuracy. Fahrenheit fixed his freezing point at 32°, to avoid errors in measuring the temperature. He was elected a fellow of the Royal Society, of London in 1724, and died on Sept. 16, 1736. For all practical purposes Fahrenheit's thermometer is the one in general use in the United States.

Fairbairn (*fâr'-bârn*), **Andrew Martin,** a notable Scottish theologian and principal of Mansfield College, Oxford, was born near Edinburgh, Scotland, on Nov. 4, 1838, and educated at the Universities of Edinburgh and Berlin and at the

Evangelical Union Theological College, Glasgow. For a time he held charges at Bathgate and Aberdeen, and from 1877 to 1886 was principal of Airedale College. In the latter year he was elected principal, on its foundation, of Mansfield College, Oxford, where his labors as a metaphysician and theologian have made him famous. He resigned in 1908. His many books, which are erudite and scholarly, have added greatly to his repute as a divine. These embrace *Studies in the Philosophy of Religion and History; The City of God; Christ in Modern Theology;* and *Religion in History and in Modern Life.*

Fairbairn, Sir William, a notable Scottish engineer, was born at Kelso, Scotland, on Feb. 19, 1789. He was the first to use iron instead of wood in the shafting of cotton-mills. He also was among the earliest of iron shipbuilders, and made many improvements. Fairbairn built the tubular bridge across Menai Strait, after a plan of Robert Stephenson's. He improved upon this in the construction of the Britannia and Conway bridges, and, patenting his design, erected more than a thousand bridges upon this principle. He also devised improvements for steam-boilers and other steam machinery. In 1869 he was made a British baronet and a chevalier of the French Legion of Honor. He published many works and papers on iron bridges, boilers, mills. Fairbairn died at Moor Park, Surrey, England, on Aug. 18, 1874. See Smiles' *Lives of the Engineers.*

Fairbanks, Charles Warren, American statesman, was born in 1852 near Unionville Centre Ohio. His father was one of Ohio's pioneers, having left his early home in Vermont in 1836. Mr. Fairbanks attended Ohio Wesleyan University, graduating with a very creditable record in 1872. After graduation he studied law, and was admitted to the bar in 1874. He then went to Indianapolis, Ind., and entered upon a successful legal practice. In 1893 he received the entire support of his party as nominee for U. S. senator, but was defeated by David Turpie, the Democratic candidate. In 1893 he was delegate-at-large to the Republican national convention held at St. Louis, and in 1897 became U. S. senator. The following year he was appointed member of the Joint High-Commission which met in Quebec to settle matters of dispute between the United States and Great Britain relative to the seal fisheries of Alaska. He was elected vice-president of the United States in 1904.

Fairfax (*fâr'făks*), **Thomas, Lord,** generally known as Sir Thomas Fairfax, an English general, was born at Denton, in Yorkshire, England, on Jan. 17, 1612. He distinguished himself at the battle of Marston Moor in 1644, and in 1645 was appointed to the command of the parliamentary forces. In 1650 he refused to march against the Scots, and the command was given to Cromwell. He retired into private life, and in 1660 was appointed head of the commission sent to The Hague to arrange for the return to England of Charles II. He died at Nunappleton, Yorkshire, on Nov. 12, 1671. See his *Correspondence.*

Fairmount Park. See PHILADELPHIA.

Fair Oaks is a small place in Henrico County, Virginia, the scene of a battle fought between the Union forces under General McClellan and the Confederate army under General Johnston, on May 31 and June 1, 1862. At the end of two days' fighting the Confederates retreated, their loss being estimated at 6,500. The Union loss was 790 killed and 3,627 wounded.

Fair'y or **Elf,** an imaginary being, generally thought to be of human form but very diminutive. A belief in fairies has been among the superstitions of most European nations. Other names for them are elves, brownies, dwarfs, pixies, mermaids, sirens, banshees, kelpies and gnomes; while Puck, Mab, Oberon and Titania are well-known names of individuals among them. The belief in their wonderful powers varies in different countries, but in all they have a great deal to do with human beings and their affairs. In England the good fairies care for the home, sweeping the house, preserving the butter, while the evil ones lure people into dangerous places. The pixies in Ireland are thought to be the souls of children who have died unbaptized. The banshee is an Irish fairy or elf, watching over a special family, as the brownies do in Scotland, many a Scottish family placing a dish of milk in a convenient place for the brownie, as regularly as for the cat or the dog. The kelpie, mermaid and siren are all water-fairies; the mermaids and sirens, half-woman, half-fish, with their beauty and their song lure unsuspecting travelers to their death. During the day fairies are invisible to man; they have their homes in the clefts of rocks, in caves and in forests. It is dangerous to come upon them unawares when in their night revels, and ill-luck follows one who offends them. The literature of all countries abounds in fairy tales. *Midsummer Night's Dream, Walpurgis Night,* Hans Andersen's Danish *Stories* and the Grimm brothers' popular German ones are examples well-known. See Keightley's *Fairy Mythology.*

Faith'full, Emily, was born at Headley Rectory, Surrey, England in 1835, and devoted her life to the improvement of the condition of working-women. In 1860 she founded a printing-house in London, where women only were employed as compositors. In 1863 she founded the *Victoria Magazine,* for the purpose of setting forth the claims of women to remunerative employment. Queen Victoria recognized Miss Faithfull's work by appointing her her publisher, and she was awarded a pension of $250. She died at Manchester, England, on May 31, 1895.

Falcon (*fą'k'n*), the name given to a number of diurnal birds of prey closely related to the hawks, properly applied to those belonging to the genus *Falco*. Birds of great courage and power of flight, with a hooked bill bearing a notch on the upper part and sharp claws adapted for grasping, falcons live in nearly all countries of the world, and there are many varieties. The peregrine or duck-hawk is the type of the family. It occurs both in Europe and America. The body is about eighteen inches long and the spread of wings about three and one half feet. It is dark bluish-ash above, with cross-bands of brownish black, creamy white below, with spots and bars of black. The throat is white, and there is a black spot on the cheeks under the eye. The eyes are brown. The birds rise in spirals above their prey and strike them from above, the shock of the blow and the sharp talons usually killing the prey at once. Besides water-fowl, they attack pigeons, snipe and other birds. They nest usually on rocky ledges. The gerfalcon is the largest and finest of the falcons. It is found in the northern parts of Europe and America, as also in Iceland and Greenland. The American form resembles the peregrine in color, but the Greenland form has white plumage with dark bars. Both the peregrine and the gerfalcon fly with astonishing rapidity; it has been estimated that they fly at times one hundred and fifty miles an hour. The pigeon-hawk is found throughout the United States. Although smaller than the duck-hawk, it is bold and fearless and kills birds larger than itself. It is like the European merlin. The common sparrow-hawk of the United States belongs also to the group of falcons. It corresponds to the very common British kestrel. It will nest in deserted woodpecker-holes or in martin-boxes. It feeds mainly on field-mice, insects and, occasionally, a small bird. The falcons are interesting from the circumstance that they were long used in the chase of smaller game. Long before the Christian era these birds were employed in this way, and falconry was a common field-sport for the nobles in Europe for many centuries. It was introduced into England about the ninth century. The birds were trained for taking a particular kind of game, including all kinds of birds,—even those as large as herons,—hares, rabbits, etc. They were carried out perched on the arm or glove of the hunter, frequently with a small leathern hood over the eyes, which was removed just before releasing the bird. Two kinds of falcons were recognized: noble hawks, with long wings that fly high above their prey and stoop to strike it from above, and ignoble hawks with short wings, that fly low and chase after their prey. The noble hawks, like the peregrine and gerfalcon, have dark brown eyes, the ignoble ones light yellow eyes. Falconry is still practiced in eastern countries and, though rarely, on some large estates in England.

PEREGRINE FALCON

GERFALCON

Falconer (*fą'k'n-ẽr*), **Dr. R. A.**, president of the University of Toronto, was born in Nova Scotia. He was selected for this position out of eighty men under consideration by the governors. He was educated at Queens Royal College, Trinidad. While studying at Trinidad, he passed the Cambridge local examination with firstclass honors. He also passed the London matriculation, winning the Gilchrist scholarship. Later he took his M. A. with honors at Edinburgh. He studied for some time in Germany. Returning to Nova Scotia in 1892, he was appointed lecturer in exegetics in the Presbyterian College, Halifax, becoming professor in 1895, and later was appointed principal of the college. His work there was most successful. As an indication of his breadth of view it may be said that he was given the degree of LL. D. by St. Francis Xavier's College in 1905. In his new and wider field of work every indication points to a successful career, perhaps the premier educational position in Canada.

DR. R. A. FALCONER

Falkland Islands (*fa̤k'land*), a cluster of islands in the south Atlantic, some 250 miles east of Patagonia. The group consists of East and West Falkland, with an area of 6,500 square miles, and about 100 small islands. Some of the islands are filled with myriads of penguins, and the governor has been called the king of the Penguins. The population in 1911 was 2,272. The climate is healthful, and resembles the Orkneys, off Scotland. There are no trees on the islands, neither is coal found there, but peat is plentiful. The chief industry is sheep-raising. The islands were first sighted by Davis in 1592 and received their present name in 1689 from Captain Strong in honor of Lord Falkland, his friend. The chief town is Port Stanley. Since 1833 the islands have belonged to Great Britain.

Fall River, a city of Massachusetts, 49 miles south of Boston, noted as a great cotton-manufacturing center. It contains nearly 42 cotton mills, and more cotton goods are made here than at any other point in America. A very important industry is the dyeing and finishing of textiles, and others are foundry and machine-shop products, etc. It has fine public schools, with a teaching force of 300 and an attendance of 17,100 pupils. The city has a free public library of about 40,000 volumes. Population, 119,295, an increase of over 60 per cent. in 20 years.

Fallieres, Clement Armand, French politician and legislator, born at Mezin in the Department of Lat-et-Garonne in 1841. He now is president of France, having been elected to that office on January 17th, 1906. At 30 he was elected mayor of Nérac, and in 1876 he became a representative in the national chamber of deputies. He was a member of many of the cabinets from 1880 to 1892. He was elected to the senate in 1890 and subsequently acted as president of that body.

Falls of Montmorenci. See QUEBEC.

Faneuil Hall. See BOSTON.

Faraday (*făr'ȧ-dā̇*), **Michael,** the leading physicist of the English-speaking races during the first half of the 19th century, was born in the suburbs of London on Sept. 22, 1791, and died at Hampton Court on Aug. 25, 1867. At 14 he was apprenticed to a bookbinder, and there managed to educate himself largely from the books which were brought in for binding. Having attracted the attention of Sir Humphry Davy by a set of notes which he had prepared on some lectures heard at the Royal Institution, he received an appointment as assistant in chemistry at the Royal Institution. This was the beginning of that remarkable scientific career which led Sir Humphry Davy in his later years to reply to the query: "What do you consider the greatest scientific discovery you have ever made?" "Michael Faraday." Among Faraday's principal achievements may be mentioned: The discovery of the laws of electromagnetic induction. (See ELECTRICITY); of those of electrostatic induction; and of those of electrolysis. (See ELECTROLYSIS); of the properties of paramagnetic and diamagnetic bodies; and of a connection between light and electricity, viz., the electromagnetic rotation of polarized light.

Every student should read his *Experimental Researches in Electricity*. His papers on electrolysis have been edited and reprinted by Professor Goodwin in Harper's *Scientific Memoirs*.

Faraday was a man of the highest character and beloved by every one who knew him. Many learned societies at home and abroad sought to honor themselves by honoring him. There is a true sense in which Faraday's work was completed by Maxwell, who clothed Faraday's ideas in mathematics, and by Hertz who showed by experiment (1888) that Maxwell's mathematical inferences were correct.

Fargo, a city of North Dakota, the county-seat of Cass County, opposite Moorehead, Minn., situated on the Red River, 254 miles west of Duluth. It is an important commercial and railroad center, having six banks and numerous other public institutions. The region about is a great wheat district, equipped with the latest and most approved farm machinery, and makes Fargo one of the great distributing centers of the U. S. for farm-equipment, as well as a manufacturing point of many articles used in farmwork. Besides a United States land-office, Fargo has the North Dakota Agricultural College, Experiment Station, a Congregational college, a Roman Catholic academy and a number of fine churches and public schools, a handsomely equipped High School, offering manual training as well as several courses. It was a small village in 1874, but now is the largest city in the state. Population 14,331.

Farinelli (*fä'rē̇-nĕl'ē̇*), **Carlo,** was one of the best singers of the 18th century. He was born at Naples or at Andria, on Jan. 24, 1705. He sang before nearly all of the European monarchs of his time, and through his voice gained wonderful power over Philip V of Spain, which gave him almost the place of a prime-minister. He died at Bologna on July 15, 1782.

Farjeon (*fär'jŭn*), **B. L.,** English novelist, was born at London, of Jewish parentage, in 1833. He spent his early journalistic and literary life in New Zealand; he married in 1877 the daughter of Joseph Jefferson, the American comedian; and for a time he employed himself as a playwright. His first story to attract attention was *Grif*, which appeared in 1870, and dealt with Australian life. This was followed by a number of tales of strong sensational interest, as *Blade-o'-Grass*, *Bread and Cheese and Kisses* and *The Betrayal of John Fordham.* He died on Aug. 1st, 1903.

Farley, John M., archbishop and Roman Catholic metropolitan of New York, was born in 1842 at Newton Hamilton, Ireland, and came as a youth to America. He studied for the priesthood at Fordham and at Troy, N. Y. He was ordained in 1870 at Rome. Archbishop Farley held many special and responsible positions, and for some time was rector of St. Gabriel's Church, New York. In 1902 his name was unanimously suggested by the diocesan rectors, provincial bishops and American archbishops for the vacant see of New York; and he received his pallium in 1903 from Pius X. Archbishop Farley is a valuable force in the conversion of thousands of motley immigrants into good citizens.

Färoe (*fā'rô*) **Islands,** a Danish group of 22 islands, 17 of which are inhabited, lying between the Shetlands and Iceland. Toward the sea they are rugged cliffs, from 1,000 to 2,300 feet high, while in the inland portions they rise into flat-topped mountains some 3,000 feet in height. The largest island is Strömöe, on which is situated the capital, Thorshavn, with a population of 984 people. There are no trees found on the islands, timber being imported from Norway. Coal and peat, however, abound. The industries of the people are sheep-farming, wild-fowling and fishing. The people speak the old Norse dialect and belong to the Lutheran Church. Population of the islands, which have an area of 540 square miles, 18,000.

DAVID G. FARRAGUT

Farragut (*făr'ȧ-gŭt*), **David Glasgow.** The ranks of vice-admiral, rear-admiral and admiral of the United States Navy were created successively to reward the services and acknowledge the genius of this greatest of American naval heroes. The operations which resulted in the capture of New Orleans and Mobile are comparable only to those of Nelson at Copenhagen, the Nile and Trafalgar. The difficulties to be overcome were infinitely greater, and the operations extended over a longer period of time. The exploits of Dewey at Manila and of Togo in the Japan Sea were accomplished under such different conditions, due to modern inventions, as to place them in a class apart from sea-fighters of even a generation ago.

Farragut was born on July 5, 1801, in a pioneer cabin near Knoxville, Tennessee, of a Spanish-descended father and a Scotch mother. Owing to his father's friendship with Commodore Porter the boy was shipped on the frigate *Essex* before his tenth birthday. Our naval academy was not established until 1845, so cadets were educated and trained at sea. When only 12, Midshipman Farragut took a prize-ship (War of 1812) into Santiago, Chile, and acted as powder-boy in the battle of Valparaiso. Forty-five years of routine duty followed, on cruisers, on training ships, testing ordnance in the department at Washington and in charge of the work of establishing the naval station at Mare Island, San Francisco. When the Cival War began he was in his 60th year. Of southern birth, with a Virginia wife and home, he decided that his fealty belonged to the nation. In February, 1862, with the rank of admiral he was given a fleet of 48 vessels, of 200 guns, the largest ever fitted out by the United States up to that time, and ordered to take New Orleans and clear the Mississippi of Confederate forts and gunboats.

Not one of his ships was an ironclad; some were propelled by steam, others were sailers; all had been built for sea-service. With these he had to operate in a narrow, shifting river-channel, pass two forts, break through chains connecting anchored barges, turn aside blazing fire-boats, risk torpedoes, sink the fleet of the enemy above all these obstructions and reduce the city. He accomplished the task in three months' time with a loss of only 37 men and one vessel. For 16 months thereafter he was so continuously under fire as he moved up the river, and so invariably the victor, that he won the nickname of Old Salamander. In January, 1864, he captured Mobile in one of the most brilliant engagements of naval history. When the dead were laid out on the deck of the flagship, he wept like a child.

Farragut was such a master of detail that he could have taken the place and done the work of any man in his fleet. Honest, upright, religious, of tender sympathies, he inspired respect, enthusiasm and personal affection. The war wrecked his health, so that he died in Portsmouth, N. H., on August 14, 1870. Congress purchased Virginia Ream's statue of him for Farragut Square, Washington, and New York City has one by Augustus St. Gaudens. You will remember this couplet from a tribute to him by Holmes:

The Viking of the River Fight,
The Conqueror of the Bay.

See *Life* by Loyall Farragut, his son.

Farrar (*făr'ȧr*), **Frederick William,** a clergyman of the Church of England and dean of Canterbury, was born at Bombay, India, on August 7, 1831. He received his early education at King William's College, near Castleton, Isle of Man, and afterward attended King's College, London, and Trinity College, Cambridge, from which he graduated in 1854. Soon after his ordination he became known for the brilliancy of his preaching, and in so high esteem were his sermons held that in 1873 he was appointed a queen's chaplain. He has often been university preacher both at Oxford and Cambridge, and the latter honored him with the doctorate of divinity in 1874. In 1876 he was appointed canon of Westminster Abbey, and in 1883 was made archdeacon. In 1895 he was made dean of Canterbury. As a writer, Dean Farrar was pre-eminent in his line. His early works were stories of school and college life. His later efforts were in theology, his *Life of Christ*, which passed through 12 editions in 12 months, making him known throughout the world. He contributed largely to magazines and periodicals, and published volumes of sermons. Among his other works are *Life of St. Paul; Early Days of Christianity; Witness of History to Christ; Seekers After God;* and *Eternal Hope*. He died on March 22, 1903.

DEAN FARRAR

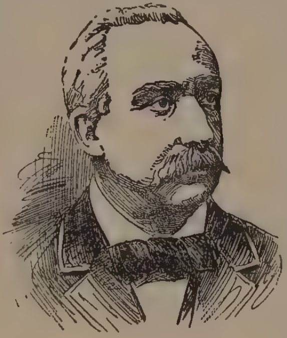
Fasho'da, a town of Sudan, upon the White Nile, was the center of a serious dispute in 1898 between England and France. It had been occupied by a French expedition under Captain Marchand; but the British, fresh from their victory at Omdurman, claimed the town for Egypt. In the end Fashoda was evacuated by the French, who in return received an extension of their possessions in Central Sudan.

Fast, doing without food for any cause, but usually as a religious ceremony. Its origin is doubtful, but by degrees it became a religious observance, and is recognized by the Roman Catholic church as a church-law of discipline. The Mosaic law set aside one day yearly for the purpose of fasting, the tenth day of the seventh month, called Yom Kippur or Day of Atonement. In course of time five more fast-days were added in memory of days of humiliation and national misfortune. Many new ones have since been added; but among the orthodox Jews few of them observe any but those of Yom Kippur and the five mentioned. Fasting in the Greek church is observed with great austerity. The principal fasts are Wednesday and Friday; Easter, 48 days; Christmas, 39 days; that in honor of the Virgin 14 days; and that of the Apostles extends from the first Monday after Trinity to the 29th of June. The Church of England and the Episcopal church of the United States recognize fasting as praiseworthy, but do not command it. See Robert Nelson's *Festivals and Fasts of the Church.*

Fates, a term in Greek mythology used to represent the three daughters of Night: Clotho, the spinner of the thread of life; Lachesis, who determines the length of the thread or the lot of life; and Atropos, or the inevitable, who cuts the thread. They were represented sometimes as young women, sometimes as matrons. They had places consecrated to them at Sparta, Corinth, Thebes and Olympia.

Faults (in geology). The earth's crust is affected by numerous fissures or joints, which extend from the surface down to unknown depths. Along some of these fissures slipping sometimes takes place, the strata on the one side rising or sinking relative to those on the other. Displacements of this sort are faults. Faulting probably is a chief cause of earthquakes. (See any text-book on geology.)

Faure (*fōr*), **François Felix,** French statesman and president (1895-99) of the republic, was born at Paris on Jan. 30, 1841, and died there on Feb. 16, 1899. He was quite a self-made man, originally a currier; but he became a merchant and shipowner at Havre and an authority on shipping, commercial and colonial questions. He took part in the Franco-Prussian War, and was decorated for services in Paris in suppressing the rising during the Commune. In 1881 he was elected republican member of the chamber of deputies, and in Gambetta's cabinet became undersecretary of state for the colonies. He held the same post in the Ferry, Brisson and Tirard administrations, and in 1894 became minister of marine in the Dupuy cabinet and vice-president of the chamber. In January, 1895, he succeeded Casimir-Perier in the presidency, and during his term was exceedingly popular.


F. F. FAURE

Faust (*foust*), **Dr. Johann,** was a famous magician and dealer in the black art, who lived in the 16th century. He has been made a central character in literature, and became the hero of Goethe's *Faust*. Luther spoke of him as the type of "the infidel and impious man." The story is that he obtained his art from Satan, making a contract with the devil that he should serve him (Faust) for 24 years and at the end of that time should have possession of his soul. The contract was signed with his own blood. Marlowe and Goethe both made the story the subject of a drama. He is said to have died in 1538.

Faust or **Fust, Johann,** a German printer, born in Mentz, Germany, who was associated with Gutenberg in the first introduction of printing. He probably had nothing to do with the invention of printing, but furnished the capital to introduce the new art. The process was kept secret at first, but at the sacking of Mentz, in 1462, Faust's workmen were scattered and the new art became public property. A Latin Bible in the Mazarin library is thought to have been printed by Faust. The probable date of his death, at Paris, is 1467.

Favenc (*făv'en*), **Ernest,** explorer and author, was born in London in 1846 and educated at Berlin and Oxford. From 1865 to 1879 he was a pioneer in Queensland, in 1878 taking charge of the Queenslander expedition from Blackhall to Port Darwin, and he has since been on several minor expeditions in the northern territory and in western Australia. His published works include *The History of Australian Exploration*, *The Secret of the Australian Desert*, several books of fiction and many scientific pamphlets. Since 1888 Mr. Favenc has engaged in journalism

Faw'cett, Edgar, American man-of-letters, was of English extraction, and was born in New York May 26, 1847, and educated at Columbia College. He began his literary career by publishing some collections of sensuous verse, followed by novels and essays. Of the latter, the better known are *A Gentleman of Leisure*, *Miriam Balestier* and *A Demoralizing Marriage*. Besides fiction and verse he has written plays and *Agnosticism and Other Essays*. Fawcett died on May 1, 1904.

Faw'cett, Henry, an English statesman, was born at Salisbury, England, in 1833. After graduating at Cambridge he studied law, intending, as he said when a boy, to enter Parliament and to work for all who were "desolate and oppressed." His hopes seemed suddenly blasted, when, while out shooting with his father, the contents of his father's gun entered both eyes, blinding him completely. But, with rare courage, he determined to accomplish, though blind, whatever he had planned to do when he had his sight. He entered Parliament in 1865, where he carried out his early plans of working for the oppressed in many reform-measures for factory children, for the native population of India, for the common people in keeping open spaces, such as Epping Forest and the New Forest, for their benefit. He became postmaster-general in 1880, and within a fortnight had inaugurated five reforms: the parcel-post, postal orders, a postal savings-bank, postal life-insurance and cheap telegrams. He instituted an annual week's holiday for country-postmen and encouraged the employment of women. He died on Nov. 6, 1884. A national memorial has been erected to him in Westminster Abbey. See Leslie Stephen's *Life of Henry Fawcett*. His wife was a distinguished political economist and publicist.

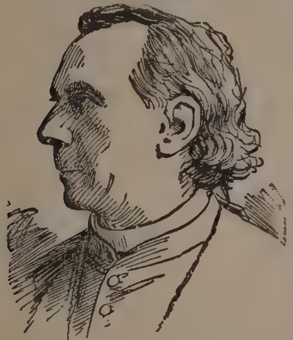
Fawkes, Guy, a conspirator, born in 1570, concerned in the Gunpowder plot, for which he was hanged on Jan. 31, 1606. See GUNPOWDER PLOT.

Feast. See FESTIVAL.

Feathers, the outer covering of birds. No other animals possess feathers; they are outgrowths from the surface-layer of cells and correspond to the scales of fishes and reptiles and the hairs of other animals. They are usually arranged in definite tracts, with smooth spots between them, as may be seen by plucking any common bird. A complete feather is composed of a lower hollow stem or quill, which passes into a four-sided shaft filled with pith. From the shaft barbs spring right and left and carry smaller projections called barbules, which interlock by means of little hooks. This close interlocking gives firmness to the vane of the feather. When the barbs are fine, the feathers are soft and downy. There are two kinds of feathers: the contour-feathers that give form to the bird and are compact, and the down-feathers distributed among them. Feathers are formed from a papilla or little knob of cells, that become inclosed in a pocket of the skin, called a follicle. The little papilla is richly provided with blood-vessels, and is the feather-germ from which the feather grows. A sort of mold for the outlining of the feather is produced within the follicle, and as it grows it is pushed from the follicle and dries in the air. The quill is inserted into the mouth of the follicle. Moulting or shedding of the feathers occurs annually, all the large wing and tail-feathers, as well as the smaller ones, being shed and renewed, usually in the fall. In addition to this general moulting, there frequently, in the spring, is a partial shedding of the smaller feathers. The colors of feathers are due to minute granules of coloring-matter or pigments of different hue. Feathers are extensively used in millinery and for stuffing pillows; the quills are used for pens, toothpicks, holding hairs for artists' brushes, etc.

Feeding-Stuffs for stock are commonly classed as concentrates and roughage. The former are those with a narrow nutritive ratio, as grains (see BALANCED RATION); the latter are the coarse forages with much fiber or water. Roughage may be dry forage, as cured timothy, clover, alfalfa, etc.; or green forage. The latter may be fed in pasture somewhat before reaching maturity, or cut and fed green, then known as soiling-crops; or cut and stored in a silo, to remain juicy for winter feeding with dry feed, the material so stored being known as ensilage (q.v.). Animals in pasture need less of concentrated food than those on dry forage; but more can be fed from the same number of acres by giving the soiling-crops to stock under cover. Forage crops include corn, clover, alfalfa, cowpeas, rape, oats and millet. Sometimes more than one are sown together, as oats, peas and rape for hogs, or rape with wheat for pasturage after harvest. If the change from dry forage to green pasturage be too sudden, stock is liable to the trouble known as bloat, due to rapid fermentation of the food. See Henry's *Feeds and Feeding*, Jordan's *Feeding of Animals* and bulletins of Experimental Stations and the U. S. Dept. of Agriculture.

Feehan, Archbishop Patrick A., an American Roman Catholic prelate, was born in County Tipperary, Ireland on Aug. 29, 1829, and educated at Castle Knock and Maynooth Colleges. Emigrating to the United States in 1852, he became pastor of a church at St. Louis and president of a church seminary at Carondelet. In 1865 he was consecrated bishop of Nashyille, Tenn., and in 1880, when Chicago was made an archiepiscopal see, Bishop Feehan became its first archbishop. He died on July 12, 1902.



ARCHBISHOP FEEHAN

Feeling. This term is ambiguous, as it may refer to sensations of touch or to the general subjective sense of the pleasantness or unpleasantness of experience. It is in the latter meaning that the word is here used. Feeling is commonly contrasted with cognition, the latter giving the objective qualities of things, *i. e.*, their color, shape, size, causal relations, etc.; the former, the way in which they affect us. Traditional psychology has commonly distinguished between cognition, feeling and volition, as distinct powers or faculties of the mind; but to-day the tendency is to regard all consciousness as involving activity (see Child Study). Volition therefore is only a type of cognition. When attention is concentrated on a certain act, and one feels willing to do this act and is moreover aware of consent to its performance, the mental state is one of will. It follows that consciousness has two fundamental phases, cognition and feeling, both of which have an important bearing on action. When consciousness involves relatively much feeling and little thought, impulsive, uncontrolled action follows; when the cognitive element increases in proportion, the activity comes under guidance, becomes voluntary. In any case the amount of feeling is a fair indication of the dynamic force of a state of consciousness.

The relation between feeling and cognition has been an interesting question in the history of psychology. Plato assumed that feeling is of two kinds: one dependent on bodily conditions, as the appetite, physical pleasure and pain; the other dependent on ideas, as social, aesthetic and moral feelings The former is base, the latter noble. This view is a common one and is retained by Herbart, who reserves the word *feeling* for the latter class and calls the former emotion; a terminology not preserved by modern psychology. According to Herbart education should strive to control or suppress the emotions, but the feelings should be encouraged, for from them springs interest (q. v.), the dynamic force of learning. Modern psychology finds no essential difference between physical and intellectual feelings, and ascribes to both the same general function in the life of the organism.

Three fundamental problems are involved in the recent psychology of feeling. The first concerns the classes of feeling, the second its conditions and the third its function. As regards classification all distinctions based on the nature of the object that rouses the feeling rather than upon its subjective effect are set aside. Social, ethical, aesthetic, sensuous and intellectual feelings are no longer thought to be distinct varieties. Wundt, the German psychologist, offers the most elaborate classification of pure feeling. He says that we may be affected in six ways, pleasantly or unpleasantly, with excitement or depression, or with strain or relaxation. Other psychologists reject all but the first two, claiming that excitement and depression, strain and relaxation are distinguishable only by means of the kind of sensations involved and are not classes of pure feeling. For instance, strain, they claim, tells us that our muscles are moving with difficulty and not how this motion affects us. It may be either pleasant or unpleasant.

As regards the conditions of feeling we again have much discussion and no certain agreement. It is generally recognized that sensations of ordinary intensity are usually agreeable, whereas those that are either very feeble or very intense are usually disagreeable. Professor Angell adds two other conditions which seem accurately stated and suggestive. He says that whenever the bodily tone is good, normal experience is pleasant, but the same experience may be very unpleasant to one who is tired or sick. Again, whatever interferes with our purposes, as the failure to recall a name that we wish to use, the inability to see any suggestion looking toward the solution of the problem at which we are working, the recognition that we have omitted an indispensable step in some work that we are carrying on, are all disagreeable. On the other hand, whatever furthers the purposes of the mind is pleasant.

It will be seen that on this basis disagreeable feelings are the spur that incites us to intenser activity in readjusting ourselves to conditions that at present are unsatisfactory, while agreeable feelings encourage this activity when it is successful or seems likely to prove so. Feeling is the stimulating and relative agency in mental life. It is not so much a result of experience as a judgment on its significance and value.

A similar explanation can be given of the function of the emotions. These are very complex mental conditions in which some exciting object, *e. g.*, a dangerous beast, occupies the focus of attention, but the background of consciousness is made up of a mass of organic sensations arising from the general bodily disturbance that constitute reflex reactions to the terrifying object. These organic disturbances consist in changes in the heart-beat, in the circulation and in the activities of the digestive and secretive organs, as well as vigorous expressions of the outer muscles. The emotions are usually toned with very intense feeling. So important are the organic sensations that Professors James and Lange have declared that without them there is no emotion, but merely an indifferent intellectual apprehension of the exciting object. So far, therefore, as we can stimulate or suppress emotional expressions, we can excite or allay the corresponding emotions. This offers a valuable suggestion to the teacher concerning the importance of encouraging the expression of desirable emotions and discouraging that of others.

The organic and external expressions of emotion may both be regarded as instinctive. In many cases their utility is obvious, as in that of flight because of fear or striking from anger. In other cases, although no longer useful, they may have served our ancestors. The paralysis of fear, harmful to us, causes the lower animals to lie quiet and thus escape the observation of their enemies. A still more significant function of emotional excitement is brought out by Professor Dewey, who points out that the violent internal disturbances that cause emotions constitute the condition for an immense amount of experimental activity through which eventually the unusual situation that excites the emotion may be satisfactorily dealt with. Emotion like feeling is thus seen to be a spur to readjustment, and frequently a desirable aid to education. See CHILD STUDY, ADOLESCENCE, INTEREST. Consult James's *Principles of Psychology*, Holt & Co.; Angell's *Psychology*, Holt & Co.; and Ribot's *Psychology of the Emotions*, Scribners.

E. N. HENDERSON.

Feldspar or **Felspar,** a class of minerals always found in granite rocks and, when decomposed, forming clay. It is what is known as a rock-forming mineral, that is, it is one of the substances that crystallize when lavas solidify into firm rocks or when rock-masses become crystalline from heat and pressure. Feldspars always contain silica and alumina, while the other constituent or constituents vary. There are several varieties, known as soda-feldspar, lime-feldspar, potash-feldspar, etc., according to the composition. In granite the color is given by feldspar, and so we have gray, red or pink granites. Some varieties are used in jewelry, because of their hardness, which admits of a beautiful polish, and of their bright colors. Labradorite, so named because found by Moravian missionaries on the coast of Labrador, is one of the most beautiful kinds used for this purpose; so are a variety which is cut into stones known as moonstone and the Amazon stone, a bright green in color, found at Pike's Peak, Col. Of the clay-formed feldspar-rocks, those which have the most feldspar make the finest clays, such as kaolin, and are much used in porcelain-manufacture.

Felix, Antonius or **Claudius,** a Roman governor of Judæa in the time of the Apostle Paul. His wife was Drusilla, according to Tacitus, a daughter of Antony and Cleopatra. He was an energetic ruler, clearing the country of the robber-bands that abounded and holding the seditious Jews in check. When Paul was brought before him as a prisoner, and he heard him "concerning the faith in Christ," he trembled and said: "Go thy way for this time. When I have a convenient season, I will call for thee." When he was recalled in 62 A. D. to Rome, he left Paul in prison to please the Jews.

Fellah (*fĕl'ȧ*), an Arabic word, meaning tiller of the soil. Fellahin are the descendants of the ancient Egyptians, intermingled with Syrians and Arabs. The men are of middle stature, large skull and oval face, thick lips and small hands and feet. The women are slender and graceful, and often of beautiful features. They marry at eleven, become mothers at twelve, and grandmothers at twenty-four. Their food consists almost entirely of vegetables, and their drink is Nile water and coffee. They exhibit the moral qualities of the ancient Egyptians and inherit their traditional hatred against the paying of taxes. See A. B. Edwards' *Fellah and Fellahin.*

Fellowship (*College*), an honor granted by a university to a graduate who shows promise of high attainment, accompanied by an annual stipend. The fellow or recipient of the fellowship is expected to pursue advanced studies in some chosen department of the university. In America these studies usually are along the line of advancement to a higher academic degree. In some instances the fellow is expected to perform some service to the university, as giving a certain amount of instruction, in return for his fellowship. Sometimes traveling-fellowships are given, in which case the fellow has the privilege of using his stipend to visit other universities and pursue his work there instead of at the university granting the fellowship. The income from a fellowship varies from $120 *per annum* to $1,000 and over, the usual value being $500. The custom of giving fellowships is an old one in several European universities, but of recent origin in the United States. In Oxford University, England, a fellowship used to be granted for life, forfeitable, however, in case of marriage or of attainment to a position in the church or upon admission to the bar. In Cambridge University, England, fellowships are now held for six years. In America they are granted only for one year, but often may be renewed for one or two years more.

Felt, a fabric formed without weaving, made principally from wool. The making of it is an ancient art in some parts of Asia, but the first successful mechanical process was invented by J. R. Williams, an American, about 1825. It is made by forming the wool into thin sheets. A number of these are piled together and then submitted to pressure between rollers, some solid and some hollow, containing steam. The rubbing action forms them into a compact cloth, which is held together by the interlocking of the fibers. Such felt-goods as carpets and table-covers are usually printed with patterns in colors. Felt made from furs is used in the manufacture of hats, etc.

Fencing is the art of attack and defence with foils, swords or any weapon employed for cutting or thrusting. The rise of fencing has been due to the introduction of gunpowder, which rendered armor useless and made it more necessary to defend oneself with one's weapon. The rapier was invented for attack alone, and the dagger used for defence. The use of the blade as both "sword and shield" is a later development, which involved the shortening and lightening of the rapier. The Italian style of fencing is active and violent; the French, which is now more popular, is guarded and reserved. German fencing resembles the Italian type. In student-duels a double-edged blade, sharpened near the point, is the weapon employed. In French duels a regular type of small sword, for pointing only and not for thrusting, about 33 inches long, is the ordinary weapon. In fencing, gloves, a leather breastplate and a wire mask should be worn. The foil, which is of steel, is covered at the point by a rubber button.

Some of the terms used in fencing occur so frequently that they should be defined. A *feint* is a movement to mislead. A *riposte* is a thrust made after a parry. A *parry* is a defence against a thrust. The *appel* is a smart stamp of the right foot upon the ground in a retreat or a feint. *Prime* and *quarte* refer to the part of the body to the left of the blade and above the hand, *septime* and *quinte* are also to the left but below the hand. To the right above the hand are *tierce* and *sixte;* while *octave* and *seconde* are on the right below the hand. In a *lunge* the right foot is advanced, the left leg straightened and the arm thrust straight forward from the shoulder. To be *engaged* is to be opposite one another upon guard. To *feel the blade* is to rest one's sword lightly against the sword of the other in order to foretell his next attack. But the eye is ever the best index of such an intention.

Fénelon (*fā-ne-lôn′*), **François de Salignac de la Mothe** a priest of the Roman church, was born in the Chateau de Fénelon, Perigord, France, on Aug. 6, 1651. Early in life he showed signs of great piety, and in his twentieth year entered the newly-founded seminary of St. Sulpice to study for the priesthood, and was ordained in 1675. In 1689 Louis XIV appointed him preceptor of his grandson, the young duke of Burgundy. As an acknowledgment of his merits, the king in 1694 presented him to the abbey of St. Valery and in the following year to the archbishopric of Cambrai. Fénelon was a man of breadth of character and practical piety. In middle life he engaged in a long controversy with Bossuet which ended by a decision of the pope against him, March 12, 1699. The beauty of his character was well-brought out in his taking the first opportunity to publish from his own pulpit the brief of his condemnation. His benevolence, charity and liberality were recognized by the allied army in 1709, which was instructed to spare the palace and stores of the archbishop of Cambrai. Fénelon died on Jan. 7, 1715, and was buried in his cathedral. See Mrs. H. L. Lear's *Life*. His writings include the famous *Adventures of Télémaque* and *Dialogues of the Dead.*

Fe′nians, a political association of Irishmen having for its object the overthrow of British rule in Ireland. The name is said to be derived from an Irish military organization, called Fionna Eirinn, founded by Sedna II about 400 B. C. The modern

Fenian movement had its first seat in America in 1846, the headquarters being New York. Agents were sent to England and Ireland to incite rebellion, but were unsuccessful. Three times Canadian territory has been invaded from the United States in times of peace by bands of Irishmen, seeking to incite rebellion and disorder in fancied revenge upon Great Britain. On March 17, 1866, St. Patrick's day, the militia of the Dominion were forced to guard the frontier. On May 25, 1870, O'Neil crossed the frontier at Trout River in a demonstration against Quebec, to be driven back by the volunteers. The next year an attempt to invade Manitoba ended in force, the United States government following him over the line and arresting him. The Fenian spirit appeared again in 1883 in the Skirmishing Fund, raised to promote the free use of dynamite for the destruction of British shipping and buildings. See J. Rutherford's *Secret History of the Fenian Conspiracy.*

Ferdinand I, the Great, the first sovereign of independent Castile, was born in 1000, and died on Dec. 27, 1065. He became king in 1035 and largely extended his dominion in 1053 by defeating his brother, Garcia III of Navarre, and annexing a large portion of his provinces. Early in his reign he fought against the Moors and extended the Christian frontier by defeating the emirs of Toledo, Saragossa and Seville. He laid claim to the title of emperor of Spain, and a decision favorable to his rights was given at a conference held at Toulouse, so far as they related to the territories which had been conquered from the Moors.

Ferdinand III, king of Castile and sometimes known as Saint Ferdinand, was, on the death of Henry I of Castile, proclaimed king. On the death of his father, in 1230, he also became king of Leon. His energies were chiefly devoted to the prosecution of wars against the Moors, and among his victories are those of Cordova in 1236 and Seville in 1248. He died at Seville on May 30, 1252, while planning an invasion of Africa. Ferdinand III was a champion of the Christian faith, and for his zeal was canonized by Pope Clement X in 1671. His feast-day in the Spanish calendar is May 30.

Ferdinand V of Castile, II of Aragon, III of Naples and II of Sicily, was born in Aragon, Spain, on March 10, 1452. He married Isabella, the sister and heiress of Henry IV of Castile, and they were crowned joint sovereigns of Castile. He was surnamed the Catholic, because of his zeal for Christianity. He drove out the Jews, numbering about 160,000, from his kingdom and ended the Moorish power in Spain (1492). He added Naples and Navarre to his dominion, and united the whole peninsula, excepting Portugal, into one state. He was one of the ablest princes of his age, though crafy, ambitious and untruthful. He died on Jan. 22, 1516. The most interesting event of his reign to Americans, the discovery of America by Columbus, owes little if anything to his influence. This honor belongs to Isabella. See Prescott's *History of Ferdinand and Isabella.*

Ferdinand I, emperor of Germany from 1556 to 1564, was born at Alcalá, in Spain, in 1503. He was the son of Philip I and brother of Charles V, whom he succeeded. In 1521 he married Anna, daughter of Ladislaus, king of Bohemia and Hungary; and when her brother Louis fell in battle, in 1526, he claimed the crown in right of his wife. After a series of bloody battles he gained the upper hand, and secured Bohemia to the house of Austria. He died at Vienna in 1564, and was succeeded by his son, Maximilian II.

Ferdinand II, emperor of Germany from 1619 to 1637, was born at Gratz, Austria, on July 9, 1578. It is said that he took an oath to reinstate the Catholic religion in his dominions at any cost. When he became emperor of Germany, he extended this religious war, which had begun in his own duchy of Styria, over a large part of Europe. This was the famous Thirty Years' War. He had subdued nearly all of his subjects and almost stamped out Protestantism, when the great Protestant hero, Gustavus Adolphus of Sweden, appeared upon the troubled scene. The ability of the Swedish generals being more than a match for that of the Austrian generals, the balance of victory reverted to the Protestant arms, and ere Ferdinand died, on Feb. 15, 1637, he had lost all hope of ever attaining his object. His reign is one of the most disastrous in history, for Germany owes him nothing but bloodshed, misery and desolation.

Ferdinand III, emperor of Germany from 1637 to 1657, was the son of Ferdinand II, and was born at Gratz, Austria, on July 11, 1608. His reign was more peaceful than that of his father. He died on April 2, 1657, after having concluded an alliance with Poland against Sweden. He was succeeded in the German empire by his son, Leopold I.

Ferdinand I, king of Naples, an illegitimate son of Alphonso V of Aragon, was born in 1423. He succeeded to the throne in 1458, but was not recognized by Pope Calixtus III, who championed the cause of John of Anjou, and was defeated by him on July 7, 1460. In the meantime Pius II succeeded Calixtus, and Ferdinand, by making certain concessions, obtained recognition and defeated John of Anjou on Aug. 18, 1462. He died on Jan. 25, 1494.

Ferdinand IV, king of Naples, was born at Naples on Jan. 12, 1751, and when his father ascended the Spanish throne in 1759, Ferdinand succeeded him on the throne of

Naples, under a regency. His minority ended on January 12, 1767, and the following year he married Maria Caroline, daughter of Empress Maria Theresa. During the wars of Napoleon Ferdinand was forced several times to leave his country, but was finally recalled to his capital on Dec. 12, 1816. He died on Jan. 4, 1825.

Ferdinand VII, king of Spain, was born on Oct. 14, 1784, and became prince of the Asturias in 1788. For political reasons his father, Charles IV, was forced to abdicate the throne, and Ferdinand was proclaimed king on March 19, 1808. When Napoleon invaded Spain, he forced Ferdinand to resign, and Joseph Bonaparte was proclaimed king in his stead. Wellington's victory at Vittoria on June 21, 1813, induced Napoleon to treat again with Ferdinand, and as a consequence he recognized his title to the throne of Spain, one of the conditions being that the English were to be expelled from the peninsula. Ferdinand was continually in open conflict with the Cortes, and his death at Madrid in 1833 was signalized by the outbreak of a long and bloody civil war. Ferdinand VII was one of the most incompetent monarchs that ever reigned. During his sovereignty Spain lost New Granada, Mexico, Rio de la Plata, Chile, Venezuela, Guatemala and Peru.

Fer'guson, James, a self-taught astronomer, was born near Keith, Scotland, in 1710. When he was eight, his father, in repairing the roof of their cottage, which had fallen in, used a lever and fulcrum. This at once interested the boy, and he began to experiment with levers, to which he added a wheel and axle. Apprenticed to a farmer, he studied the stars while watching the sheep by night. He made a wooden clock, and helped to support himself by repairing clocks and taking portraits in India ink. He received a small pension from George III, and died, probably in London, on Nov. 16, 1776. He invented astronomical machines, and wrote works on astronomy, among them *Astronomy Made Easy*. See *Autobiography* and *Life* by E. Henderson.

Fer'menta'tion, the decomposition of certain substances by the action of living plants either directly or though the enzymes (which see) secreted by them. All fermentable substances are complex carbon-compounds, especially carbohydrates (such as sugars) and proteids (abundant in white of egg, meat, curds, etc.) The fermentation of proteids and other nitrogenous substances, usually accompanied by evil-smelling gases, is often called putrefaction, but it does not differ in nature from other fermentations. Gases are a common product of fermentation, but not a necessary one. All protoplasm appears to have the power of producing fermentation under certain conditions. Many plants can in this way, instead of by normal respiration, secure energy sufficient to maintain life for some time without free oxygen. Ripening fruits, as pears and apples, and chopped-up plants, as fresh ensilage, show energetic fermentations of this direct kind. During such periods the usual functions of the plant are retarded or suspended, in which they differ from the lower organisms. The decomposition of foods in digestion is not ordinarily thought of as fermentation, but it is impossible to distinguish the two clearly.

A number of plants of the simpler sorts, notably yeasts, certain moulds and most bacteria, produce conspicuous fermentations, each after its kind. They therefore are called ferment-organisms or, formerly, ferments. As enzymes were also called ferments, the two were distinguished as organized and unorganized ferments. Since many of the ferment organisms act as such by secreting enzymes (*e. g.* yeast), the distinction is invalid.

Fermentations usually take their names from the most striking products. Thus, yeasts and some moulds work *alcoholic* fermentation in sugary liquids, forming alcohol, carbon dioxid and several less important products; certain bacteria cause the souring of milk on account of the formation of lactic acid, etc. (lactic F.); others form acetic acid, etc. (acetic F.) from alcohol, as when wine or beer sours. Many other forms of fermentation occur, the products of one being the material for subsequent decomposition. Some fermentations, especially the alcoholic ones, are of much economic importance. Thus the making of bread, wine, beer, vinegar, butter and cheese is dependent upon the proper action of the ferment-organisms that grow in these substances. Many household and commercial processes, as canning, cold storage, etc., are to prevent the growth of ferment-organisms. C. R. BARNES.

Ferments. See ENZYMES and FERMENTATION.

Fern, a flowerless plant growing from a rootstock, producing spores instead of seeds, the leaves or fronds usually raised on a stalk. The notable fern-families include the tall swamp-ferns; coarse ferns; large and coarse ferns of swamps and woods; small and medium-sized ferns; delicate rock or wood-ferns; shield-ferns. The brake is the most widely distributed of the ferns; in Oregon it sometimes reaches a height of seven feet. The delicate maidenhair is one of the most highly regarded ferns, its haunt dim, moist woods. The tiny leaves on the slender black stem suggest fragility, but this fern will bear transplanting if a shady, damp corner is provided for the replanting. The evergreen wood-fern, a feature of our northern woods, flourishes throughout the year; it varies from a few inches to three feet in height. As a rule ferns other than the evergreens are not to be seen until the latter part of April, at which time the rolled-up fronds appear; some well-protected in warm wrappings, some quite naked. By May they show in their beauty of delicate tracery and fresh greenness; by June they are well-grown; by mid-July they are in most luxuriant leafage and many in fruit. August is considered the best month in which to search for our rare ferns. In the fall the hardy brake turns brown and withers soon; most of the other ferns follow the fashion of the trees in the matter of autumn coloring. See Parsons: *How to Know the Ferns*. See FILICALES.

Fernando Po. See SPANISH AFRICA.

Fernie, a town of 3,500. It is 65 miles east of Cranbrook on the Crowsnest Pas. Railway. It is noted as being the center of the coal-mining industry for this part of British Columbia. The coal-mines in and near the town are practically inexhaustible. The demand for coke and coal is daily increasing, and this ensures continued growth and prosperity for the town. Toronto capitalists largely control the coal industries at Fernie.

Ferrara (*fĕr-rä′rä*), capital of the province of the same name, in Italy, is situated on the River Po, 30 miles from the Adriatic. The most noticeable building is the ducal palace of the Estes, built in the 14th century. It is remarkable for its art-associations. Under the dukes of Este it produced a good school of painters, and in literature it is closely associated with Tasso, Ariosto and Guarini. The university, founded in 1264, has a library of 100,000 volumes. Ferrara was the birthplace of Savonarola. At the period of its greatest prosperity it had a population of over 100,000, and now has 82,310 inhabitants.

Ferret, a small, slender animal of the weasel family, closely allied to the polecat. Its color is usually a yellowish white, its length about 14 inches, and tail 5½ inches. It originally was imported into Europe from Africa. It is used in rabbit-hunting to drive rabbits out of their holes and also as an aid in getting rid of rats and mice. Even though raised in confinement, it never becomes really tame or trustworthy. Like the weasel it will make sad havoc in a poultry-yard, merely sucking the blood of the fowl it kills. It has been known to do serious injury to infants. Unlike the polecat, it is very sensitive to the cold.

Fer′ry, a passage by boat across water. Ferry-boats are made large to accommodate both foot-passengers and horses and carriages. They are either rowed across or drawn by a cable. Steam is also used to propel them.

Ferry, Jules Francois Camille, French statesman, was born at St. Dié in the Vosges, France, April 5, 1832. After being admitted to the bar in 1854 he allied himself with the opponents of the empire and carried his hostility into journalism. He was elected to the legislature in 1869 and voted against the war with Prussia. He formed a cabinet in September, 1880, which remained in office until November, 1881, and he again became premier in 1883. He was defeated in 1885, on account of his foreign policy, which involved disaster to the French troops in Tonquin. He died at Paris on March 17, 1893.

Ferryland, an electoral district of Newfoundland. Population 5,697; chief towns, Ferryland, Renews, Fermense, Witless Bay, Cape Broyle and Bay of Bulls.

Fertiliza′tion (in plants). The act of union of the male and female cells, commonly known as sperms and eggs. Among plants the name is technically applied only when the sexual cells can be distinguished as male and female. When the sexual cells are alike in appearance, the process is spoken of as conjugation. The word fertilization, however, in a general sense covers the whole sexual process, and fertilization is present in all plants excepting in the very lowest thallophytes. The real significance of the process is not understood, since asexual methods of reproduction are often more common. The result of the union of the sperm and egg is the formation of a sexual spore, known in plants as the oöspore or fertilized egg, by which a new plant is developed.

Fer′tili′zers are materials added to the soil to replace those taken from it by plants, or, in a broader sense, added to affect its physical nature. They may be commercial fertilizers, barnyard manures, compost or green manures. The element most likely to be lacking is nitrogen; after that phosphoric acid and potash. Nitrogen is needed especially to produce stem and foliage, potash for flowers, fruit and seed, and phosphoric acid for general plant-vigor. The most valuable source of nitrogen is nitrate of soda, commonly known as Chile saltpeter; muriate of soda is obtained principally from deposits in Germany; and phosphoric acid from lime-phosphates, abundant in the southeastern states and usually requiring special chemical treatment to make the acid available to the plant. Other sources of these substances are cotton-seed meal, slaughter-house tankage, dried blood, dried fish, bone, wood-ashes, tobacco-stems, horn and hoof shavings and leather-scraps. The plant-food in these varies in amount, and its availability varies according to the rapidity of their decay. Most states require on each package a guaranteed chemical analysis. But a fertilizer made up largely of leather-scraps or horn shavings would show a high percentage of nitrogen, but be of little value. The wise farmer buys his own raw materials and mixes them in proportion to suit his own crops and conditions. Commercial fertilizers are applied to fields dry, being spread broadcast and worked in or drilled in. The amount usually applied is from 400 to 600 pounds per acre. Ten pounds of nitrogen per acre furnished by a fertilizer are the least amount that will give satisfactory results; likewise 15 pounds of soluble phosphoric acid; and 20 pounds of potash. Such fertilizer is applied in gardens and lawns, either dry or in solution. The following complete fertilizer is recommended: ¼ pound nitrate of soda, one pound of acid phosphate, ½ pound muriate of potash, for every 100 square feet of garden. Lime acts principally to change physical conditions, compacting sandy soils and making stiff clay-soils loose. It also exerts some chemical influence. For barn-yard and green-cropping manures see Manures, Nitrogen-Gathering Crops and Rotation of Crops. See Robert's *Fertility of the Land*, Snyder's *Chemistry of Soils and Fertilizers* and bulletins of state experiment-stations and the U. S. Dept. of Agriculture.

Fes'senden, William Pitt, an American statesman, was born at Boscawen, N. H., on Oct. 16, 1806. He was elected in 1832 to Maine's legislature as a Whig, and in 1854 the Whigs and free-soil Democrats elected him to the United States senate. He became one of the leaders of the newly organized Republican party, and was a member of the peace congress in 1861. He was secretary of the treasury from 1864 till his resignation in 1865, when he again entered the senate. He was ranked among the first lawyers of the United States, and had few superiors as a debater. He died at Portland, Me., on Sept. 1869.

Fetich (*fē'tĭsh*), an article of worship capable of being appropriated by an individual. It is not strictly an idol, but the dwelling-place of a spirit. Flints, shells, claws, feathers, earth, sand, plants, trees, mountains may become fetiches, provided the belief exists that a spirit is lodged within them. They are attached to individuals, families and tribes. Crooked sixpences, horseshoes and four-leaved clovers, as used for "luck," are very much like the fetiches of savages. The worship of fetiches is called fetichism. See A. B. Ellis' *Tshi-Speaking People of the Gold Coast.*

Feu'dal System in the middle ages formed the connecting link between early society and the modern reign of law and order. It was based on the holding of land, and the result of the system was the establishment of the various great European powers on the ruins of the Roman empire. The feudal theory was that the king was the absolute owner of all the land in the kingdom; the chief lords held their lands from him on the condition of military service. Such was the principle of the system that prevailed over France and Germany at the time of the Norman conquest. William I introduced feudalism into England, where it prevailed in some form or other until the restoration of Charles II. The remains of the feudal system may be seen on the banks of the Rhine better than anywhere else. There are the castles of the feudal baron, the villages of his dependents and the church whose priest was his tenant. See Seebohm's *The English Village Community.*

Fez, the second capital of Morocco, is situated in a valley on the northwestern side of the Atlas Mountains. The city is surrounded with walls from 30 to 40 feet high, and with towers at intervals for cannon. The streets are narrow and unpaved, and the houses low, but their interiors often are very beautiful. There are large palaces for the sultan, and 11 large mosques, one, the mosque of Karubin, being of immense size, with 800 pillars. Tanning, weaving, pottery, fez-caps and morocco leather, particularly the red, are among the manufactures. The university, founded in 859, is one of the oldest and largest in North Africa, and at present has about 700 students with 40 professors. The population is estimated at about 140,000, made up of Arabs, Berbers, Jews and negroes. Fez was founded in 808, and has for many years been the sacred city of the Mohammedans. See De Martinière's *Morocco* (English translation).

Fezzan (*fĕz'zăn'*), a province of the Turkish empire, attached to Tripoli. It extends 390 miles north and south and 300 miles east and west. Its area is about 150,200 square miles. The inhabitants of the province number about 50,000, and are a mixed race. They are frivolous yet honest, and are notorious for their immorality. The principal town is Murzuk, having a population of about 6,500. Fezzan belongs to the desert-region of North Africa. See Barth's *Travels in Central Africa.*

Fiber, a substance resembling a thread or bundle of threads, which is either of animal or vegetable origin, except asbestos, the only mineral fiber known. Fiber is used in manufactures, and its value depends upon the structure, strength, elasticity, length, fineness and ability to absorb colors, as in dyeing. Human hair and horsehair, which are fibers, are not very useful in manufactures, because they are too smooth to hold together when twisted into a yarn. Fibers of wool, silk, cotton and flax have projections seen only under a microscope; or they will twist and curl, so that when made into yarn (or thread) they will not untwist. Among animal fibers used in the arts are wool, fur and silk. Vegetable fibers come from different parts of plants.

From the bark of some we have flax, hemp, jute and the material for paper. Cotton-fiber, the most valuable fiber known, consists of the hairs which surround the seeds of the plant. Coir fiber is from the husk of the cocoanut. From the leaves of palm-trees we have a fiber used in making ropes, mats, matting and Panama hats.

Fibre-Industries. The chief fibre-manufactures are those which involve the making of cloth; but the making of brushes, brooms, ropes, cords etc. must also be classed under fibre-industries. Many fibre-industries are not commercial but purely local; for example, the use of grasses and palm-leaves in the building of houses and the manifold uses of the bamboo. The United States import over $30,000,000 worth of raw fibre per year, and several times this quantity of manufactured fibre. For details of fibre industries in the United States see *United States Department of Agriculture, Fibre Investigations, Report No. IX.*, Washington, 1897. See COTTON, FLAX and WOOL.

Fichte (*fik'te*), **Johann Gottlieb,** a great German philosopher, was born near Bautzen, Germany, on May 19, 1762. He studied at the University of Jena, first theology and then philosophy. In 1791 he met Kant, whose disciple he had become. The publication of his *Critique of all Revelation* brought fame at once, and the appreciation of Kant, who had before treated him coldly. He held the chair of philosophy at Jena and also at Erlangen, and was appointed by the king to draw up a constitution for a new university at Berlin, of which he was elected rector, with such associates as Humboldt, De Wette, Schleiermacher and Neander. In 1813, during the war of independence, Fichte's wife volunteered her services as nurse in the crowded hospitals of Berlin, and, after five months of devotion to the sick, she was taken with the fever herself. She recovered, but her husband caught the infection, and died at Berlin, on Jan. 27, 1814. Fichte's *Address to the German Nation* and lectures *On the Nature of the Scholar*, are among his most famous as well as popular works. In philosophy he formed no school, but his influence on German philosophy and, through the writings of Carlyle, on English thought has been important. *The Vocation of the Scholar, The Vocation of Man, Characteristics of the Present Age* and *The Way to the Blessed Life* are among his philosophical works which have been translated into English. See *Memoir*, by Dr. William Smith, prefixed to a translation of his works; also *Life* by Adamson, in Blackwood's *Philosophical Classics.*

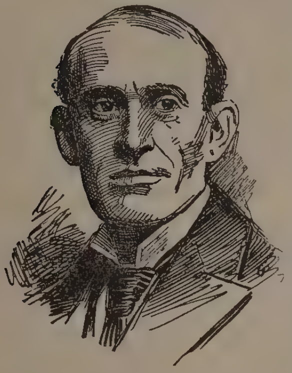
Fidelio or **Conjugal Love.** Beethoven's sole opera; known also as *Leonora*, for which four overtures were composed. First produced at Vienna, on Nov. 20, 1805, a revised edition, approved by Beethoven, was brought out in 1814, when the overture in E was first played. Imperfectly understood during the composer's life time, it now is regarded as one of the noblest types of musical dramatic art.

Field, Cyrus West, an American merchant and scientist, a brother of David Dudley Field, was born at Stockbridge, Massachusetts, on Nov. 30, 1819. He went to New York at fifteen, beginning life as a dry goods clerk at $50 a year. He built up a prosperous paper-manufacturing business, in which he was engaged for twelve years, leaving it in 1854 to enter upon his great work, the laying of the Atlantic cable. Devoting himself entirely to the task of "mooring the New World alongside the Old," he formed stock-companies, crossed the ocean repeatedly, and made every effort to interest the public in the scheme. The first successful cable was laid in 1858, but failed after being in operation a few weeks. He continued the struggle for twelve years, and at last, in 1866, established telegraphic communication between the two continents, which has never since been interrupted. Congress voted him a gold medal and the thanks of the nation, and John Bright called him the Columbus of modern times. He afterward helped to develop the elevated-railroad system in New York. He died at New York on July 12, 1892.

Field, David Dudley, American jurist, was born at Haddam, Conn., on Feb. 13, 1805, and died at New York, on April 13, 1894. He was educated at Williams College, and in 1828 was admitted to the New York bar. In the forties and fifties he took active interest in civil and criminal procedure, and in 1847 was appointed commissioner on practice and pleadings. In 1857 he was employed by New York state to prepare a political, penal and civil code, which was enacted into law. In 1873 he presented to a social science congress outlines of an international code, which was translated into several languages, and resulted in the formation of associations for the reform and codification of the laws of nations. See his collected *Speeches, Arguments and Miscellaneous Papers.*

Field, Eugene, American journalist, styled the Poet Laureate of the Children, was born at St. Louis, Mo., on Sept. 2, 1850. He studied at Williams College, Knox College (Galesburg, Ill.,) and the State University of Missouri, after which he for a time traveled in Europe. His first newspaper work was with the St. Louis *Journal* in 1873. He held positions later on papers in St. Joseph, Kansas City and Denver. In 1882 he became connected with the *Chicago Morning News*, afterward *The Record*, and here his best work was done. His poems on subjects relating to childhood gave him his widest fame. His *Little Boy Blue, Wynken Blynken and Nod, Jes' fore Christmas* and *Seein'*

Things are all familiar to school-children. His own seven children were the joy of his life. It would be difficult to name in American literary ranks a name more dear to letters than was Eugene Field. His prose-writings were marked by delicate sentiment and delicious humor, while personally he had a wide circle of friends who regarded him with affection and cherish his memory. In verse his work had the touch of the true poet—daintiness and pathetic beauty. His publications include *A Little Book of Western Verse; With Trumpet and Drum; Echoes from the Sabine Farm; Culture's Garland;* and, in collaboration with his brother, *Love Affairs of a Bibliomaniac*, etc. He died at Chicago on Nov. 4, 1895.


EUGENE FIELD

Field, Marshall, merchant and philanthropist, born at Conway, Mass., 1835. For a time he was a clerk in a store in Pittsfield, Mass., but in 1856 he secured a clerkship in a Chicago dry-goods store, and from 1860 to 1865 was junior partner in the firm. In 1865 he became a partner of the firm of Field, Palmer and Leiter, later Field and Leiter. In 1881 he became proprietor of the business, which was thenceforward conducted under style of Marshall Field and Company.

His business grew rapidly with the growth of Chicago and the development of the western country. At his death in 1906 he was head of one of the largest and best-known department-stores in the world. His business, which exceeded fifty million dollars a year, included a large wholesale as well as retail trade and the control of many factories in Europe and Asia and even Australia for the manufacture of the goods he sold. Fortunate investments in Chicago real-estate and in industrial and railroad stocks contributed much to the increase of his wealth. He gave eight million dollars to Field Columbian Museum of Chicago and to the University of Chicago a valuable piece of land for the purpose of athletics, now known as Marshall Field.

Field, Stephen Johnson, American jurist, brother of David D. and Cyrus Field, was born at Haddam, Conn., on Nov. 4, 1816, and died at Washington, D. C., on April 9, 1899. A graduate of Williams College, he studied law, and in 1849 settled in California, where he became member of the state legislature, and in 1859 was elected to the supreme court of the state. In 1863 he was appointed an associate-justice of the United States supreme court. He later was professor of law in the University of California, and acted as a member of the Hayes-Tilden electoral commission. In 1880 he was a candidate for the presidential nomination and received 65 votes in the convention. In 1897 he retired from the supreme court. He died on April 9, 1899.

Field'ing, Henry, a great English novelist, was born at Glastonbury, England, on April 22, 1707. He studied at Eton and at Leyden University. He began his literary career by writing comedies, *Love in Several Masques* being the first and among the best. He managed a theater for awhile, and also studied law and edited several newspapers. But his fame rests upon his three novels, *Joseph Andrews*, written in 1742, in ridicule of Richardson's *Pamela*, which had just appeared; *Amelia;* and the famous *Tom Jones*. Scott calls him the Father of the English novel. He died at Lisbon, Portugal, on Oct. 8, 1754, and was buried in the English cemetery there. See *Life*, in the English Men of Letters series, by Austin Dobson.

Fielding, Hon. William S., born and educated in Halifax, Nova Scotia. He engaged in newspaper work in Halifax for 20 years, was elected to the Nova Scotia Assembly in 1882, and was Premier from 1884 to 1896. He became a member of the Federal Government in 1896, taking the position of Finance Minister of the Dominion. He introduced the preferential tariff in favor of Great Britain. He was Canadian delegate to the Colonial Conference held in London in 1902, and negotiated jointly with the Hon. L. P. Brodeur the Franco-Canadian Treaty. His budget speeches clear, concise, suggestive, constructive, have won for him a great reputation in Canada.

HON. WM. FIELDING

Fig, the fruit of *Ficus carica*, which is native to Asia. The genus is an enormous one in the tropics. There are about 150 different varieties of cultivated figs. The finest figs are the so-called Smyrna figs, which are grown in the eastern Mediterranean region. Figs have been cultivated on the Pacific coast for more than a century. The cultivation of figs in California has attained large proportions. The commercial fig is the dried fruit, although where grown the fresh figs are used. One of the old fig-trees of California rises 60 feet, its trunk measuring 9 feet. There are three crops a year, the second the most important. The tree has few insect-enemies, and is considered one of the most beautiful of fruit trees. It grows readily from cuttings, and is propagated also by budding, grafting and seeds. The highly-regarded Smyrna figs, now successfully grown in California, do not bear staminate flowers, and near the trees it is necessary to plant the wild or Capri figs, which alone of the figs bear staminate flowers. To obtain pollination, the fig-wasp, which inhabits wild figs and visits the cultivated fig, has been brought into the country.

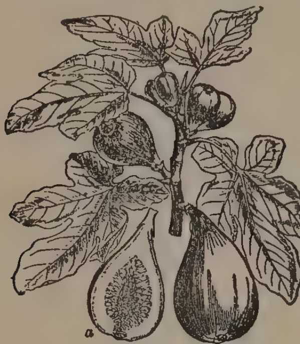


FIG PLANT

Fig. *a*. Fruit shown in section

Fiji Islands (*fē′jē*), a group of islands belonging to Great Britain, situated in the South Pacific. Their nearest neighbors are the Friendly Islands, 200 or 300 miles southeast. They are 4,700 miles from San Francisco. They lie in a ring, open on the south, and number about 200. The area is 7,435 square miles, nearly the size of Wales. They are of volcanic origin, and are surrounded by coral reefs, are well-supplied with harbors and rivers, possess a rich soil and fine climate, but suffer from hurricanes and earthquakes.

Natural Resources. With the exception of the pearl-shell industry, the resources are almost entirely agricultural. Bananas, bread-fruit, cocoanuts, sugar, corn, cotton, tea and coffee are among the products. There are hardly any native animals and few minerals.

Races. The people belong to the Polynesian race, and until the introduction of Christianity, were fierce cannibals—the terror of the sailors in those regions.

Manufactures. Considerable distilled spirit is manufactured, and there are six sugar-mills, one tea-factory, one soap-works, two saw-mills and 17 boat-building yards.

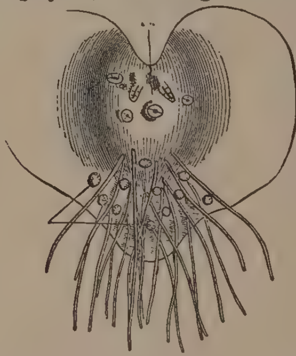
Commerce. Fiji is in regular communication with New Zealand, Australia, Canada, Honolulu, Tonga and Samoa. A subsidized steamer trades regularly within the group. There are an overland telephone from Suva to Lautoka, 120 miles long, and a telegraph between Suva and Levuka, 45 miles by land and 12 by submarine cable. The principal exports are sugar, bananas and fruit, copra and *beche-de-mer;* the principal imports, textile fabrics, hardware and iron, machinery, coal and timber. Maize is grown in exportable quantities.

History. The islands were discovered by Tasman, the great Dutch sailor, in 1643. Turtle Island was discovered by Captain Cook in 1773. In 1835 Wesleyan missionaries came from Tonga and began the wonderful work which resulted in the Christianizing of the islands. The Wesleyans now number about 100,000, and the Catholics 10,000. Since 1858 the islands have been governed by Great Britain, though not formally taken into her dominions until 1874.

Population. The total estimated population on Dec. 31, 1909, was 133,831, divided between Fijians, Rotumans, Indians and whites, the last numbering 2,459. In 1903 births among Fijians numbered 3,431, and deaths 3,298, while the Indians showed 910 births to 545 deaths and the whites 89 births to 37 deaths. Part of this is due to the fact that the population other than native has already undergone a process of selection, but it presages the passing of an interesting race.

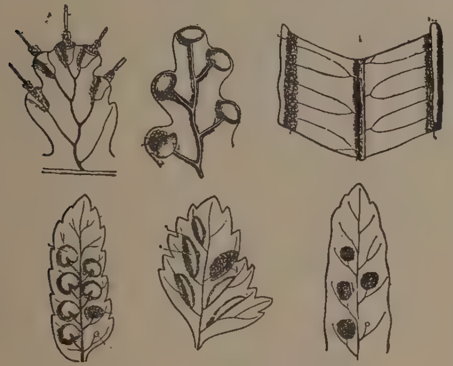
Fil′ament (in plants), the stalk-like portion of a stamen. (See Flower.) The name is also constantly applied to the peculiar thread-like bodies of algæ and fungi.

Fil′icales. The greatest group of pteridophytes, including the forms commonly known as ferns. About 4,000 species of ferns are known, the large majority occurring in the tropics, where ferns of great size grow, including the well-known tree-ferns. The ordinary ferns of the temperate regions consist only of leaves above the surface of the ground, these leaves arising from a subterranean stem. On account of what seemed to be the peculiarity of a leaf rising directly out of the ground, the name frond was once given to fern-leaves. Usually upon the under surface of these leaves the so-called fruit-dots appear, which technically are known as the sori. Each sorus or dot consists of a group of sporangia, each sporangium containing numerous spores. The sori are often protected by a flap which is an outgrowth of the epidermis and is known as the indusium. Occasionally, as in the maiden-hair fern and common bracken, the sori are along the leaf-margins,



FERN PROTHALLIUM

and these margins inroll to protect them. Each sporangium is a spore-case upon a slender stalk, and about the case a ring of thick-walled cells is developed, known as the annulus. This ring of cells aids in rupturing the sporangium wall and discharging the spores. When a spore germinates, it develops a minute, flat, green plant known as the prothallium, which bears the sex-organs. The prothallium, therefore, is the gametophyte. By the union of the sex-cells (sperm and eggs) the fertilized egg is produced, which upon germination gives rise to the well-known fern plant, the sporophyte. In the fern, therefore, the alternation of generations is very distinct, the gametophyte and sporophyte being independent of one another, so far as nutrition is concerned.


SORI OF VARIOUS FERNS

Fill'more, Millard, thirteenth president of the United States, was born at Summer Hill, N. Y., on Feb. 7, 1800. In 1819 he began the study of law; in 1823 he was admitted to the Buffalo bar; in 1828 he began his political career. In 1848 he was made Whig vice-president of the United States, and upon the unexpected death of President Taylor, in July, 1850, succeeded to the presidency, which he held until 1853. In 1856 he was nominated for the presidency by the American party, but received the electoral vote of Maryland only. He died at Buffalo, N. Y., on March 7, 1874.

MILLARD FILLMORE

Fil'ter, a vessel arranged for purifying water or other liquids. When water or some other liquid is passed through a substance, the pores or openings of which are too small to allow the solid particles to go through, they, of course, are kept back and the water is cleared The familiar process of straining is a good illustration of the principle of a filter. For home use, a simple water filter is often made by stuffing a sponge in the hole of a flower-pot, then a layer of pebbles, then one of coarse sand and one three or four inches deep of powdered charcoal, with a second layer of pebbles on top. The pebbles and gravel form the strainers, while the charcoal purifies by absorbing impurities, for which it has a special affinity. The charcoal needs to be renewed occasionally, as it loses its power, and the sand and gravel need cleansing. All filters, therefore, made on this principle, should be easily opened, so as to reach all parts. Water is often filtered, before entering a cistern, by an external filter, or in the cistern itself by means of a division-wall of brick, the water passing through the pores of the bricks. An excellent method of filtering water, devised by Pasteur, consists in forcing the liquid through unglazed porcelain. The process is slow but very effective. Special filters are required for syrups, oils and the like. Oil is passed through bags made of horsehair or canton-flannels; syrups through bags of flannel. Ale, beer and such liquids are difficult to filter, and usually need an addition of some clearing substance, as gelatine. The use of filters in the laboratory is important and extensive. Here the material used for filtering is usually paper which is manufactured for the purpose.

Finch, is the popular name for a large variety of birds, which for the most part belong to the scientific family *Fringillidae.* The birds called finches are for the most part small, often beautifully colored and not seldom endowed with the gift of song. In the United States and Canada there are said to be 135 kinds of finches; and there, indeed, is no tropical or temperate country in which finches are not found, although some scientists have wrongly excepted Australia, where, in fact, finches are plentiful. The indigo-bird, purple finch, horse-finch, American goldfinch, pine-finch, grass-finch and rosy finch are among the best-known species in this country. Canaries and sparrows are also classed as finches.

Findlay, the county-seat of Hancock County, in northwestern Ohio, in 1885 received a considerable impetus from the discovery of extensive supplies of natural gas. Besides, there are oil, rich deposits of gravel and sand and beds of clay. Of late it has not grown much, though it has a number of industries, including glass-works, pressed-brick works, potteries, foundries, machine-shops, carriage, tool, furniture, and wooden-implement factories, rail and rolling-mills and an oil-refinery. The city has some fine civic buildings and a number of churches; it contains Findlay College and has excellent public schools. It is served by three railroads, and has all the adjuncts of a modern city. Population 14,858.

Fine Arts. We have spoken of art as nature working through man's intention. It has also been defined as the doing, making or putting together of things by human skill to fit the purpose intended.

The definition of the useful and the fine arts has often been attempted by a contrasting of the meanings of the words fine and useful. This method may, however, leave opportunity for the interpretation that all fine arts are useless arts or that all useful arts are inferior arts. Modern thinking does not, however, admit of the fineness of useless things nor of the inferiority of useful ones. From what we have determined above, and what we know of the meaning of the word useful, we may easily define the useful arts as those doings, makings or puttings together, by which man supplements nature in providing the things which he *knows* he needs. The useful arts must, therefore, address themselves to and spring from man's reasoning power. Now it is quite possible, when all is said and done, that the fine arts deal with things no less important to man than those of the so-called useful arts. The distinguishing characteristic, however, which we observe in the case of the fine arts, is that here the doings, makings or puttings together address themselves to man's emotions — that they spring from his instincts or impulses rather than from his intellect. In the useful arts man is conscious of the need he is endeavoring to satisfy; in the fine arts he knows only that he is impelled to sing or dance or paint. It is quite conceivable that the only difference between these two forms of art is that they knock at different doors.

Man shudders with the cold and rain, or suffers from the sun's heat, and builds a roof and four walls within which to live. He has produced a work of useful art — the useful art of architecture. His house expresses his need of protection from the elements by tacitly meeting that need. But suppose he makes his roof project, so that a deep shadow will fall upon the walls when the sun shines, and that he makes the chimneys large, so that the house will not only be but *seem* to be a place of shelter and of warmth; and suppose that his columns be made broad at the base and lightened with decoration at their tops so that they seem to *prefer* to stand on end, as they do, and support the roof that is above them; then the house does more than merely withstand the elements, it goes so far as *to celebrate its triumph over them.* This is the *fine art* of architecture. Here we see *architecture* as a form of emotional expression — a language of the feelings. This very theme of triumph, it may be observed, has been sung, not in this art alone, but in every form of fine art. From the first aboriginal song and dance down to the days of the Sousa March, triumph has found expression in the fine art of *music.* In the days of the Romans and before and since it has been celebrated in the fine art of sculpture. In the days of the Egyptians as in our own the theme has been voiced through the fine art of *painting*; and in all times the fine art of *poetry* has made it the burden of its lay. So the common ground of the fine arts is the expression of the emotions.

Fine art may well be defined as a species of universal language. The joy, pain, devotion, scorn, patriotism, defeat or triumph which the poet felt who wrote the sonnet is felt again by the person who reads the sonnet. Fine art in other words, means a doing or acting, not on the part of the artist alone, but on the part of the appreciator as well. This is exemplified in dancing, which is a form of musical appreciation, and in which the listener becomes very evidently a part of the performance — coworker with the composer. Arthur B. Davies says: "When I paint a wave I *am* that wave." True. And it is quite as true that when you look at his painting of the wave *you* are that wave. When he sweeps his brush up over the canvas, he feels himself doing just what the wave is doing — he becomes, as he says, a sort of conscious wave; when you sweep your eye over the lines where his brush has led, you too, become a sort of acting, conscious wave. Ruskin describes a wave as "a flint cave — a marble pillar — a passing cloud." Here we have the principle which has just been stated, applied to poetry. We find ourselves, as we read, living the life of the wave, sharing its bygone past, its rushing present and its unknown future. When we hear Shakespeare's *Hamlet* into which, as we know, the author introduced many variations from historical fact, we, by reason of those very changes and interpolations, live the thing ourselves and slip into the emotions of its characters, as it were, so that they are our own emotions. When we read an unadorned statement of the historical facts upon which Shakespeare based his play, we get a far more positive knowledge of the precise things which did take place. We contemplate causes and effects, and make psychological or sociological deductions from them. We study the affair in an unprejudiced manner and wholly from without. And now we have described the two great forms of truthtelling. The first addresses itself to the senses or the feelings, springs from the emotion, and is comprehended by a reliving of it. This is fine art. The second is expressed in terms of reason, in terms of the intellect, and is understood through contemplation — a weighing and measuring of it. This is science. Neither one is the whole truth, neither one is devoid of truth. "Science is the knowing; art is the doing."

The scientist, we have said, measures, compares, expresses things in terms of each other, establishes the relations of things one to another. In answer to your question: "What is a wave?" he will tell you that a wave is the result of certain causes and principles; he will show you the materials that compose the wave; and, if your curiosity is still unappeased, he will separate those materials into their elements. He will show you the effects of conditions upon them, and he may continue, showing cause and cause of cause to the beginning of the world; or, in the other direction, he may deal with effect upon effect to the end of it. He always leads you into the relations of the wave to all other things and always *away from the wave itself.*

The artist on the other hand forces your attention *to the wave*, ignoring in his picture the fact that anything else exists. "The real work of art — its way leads nowhere and its frame ends the world." (Münsterberg). He bends all lines of attention *to* the thing in hand, fills the consciousness with it, excluding all other things, and uses it as a means of bringing you into the mood which he has experienced. Sleep is said to be the most agreeable experience of which we can know. It relieves us, for the time being, from all responsibility and the need of making any sort of choice or discrimination. Fine art brings us into a somewhat similar condition of repose or of absorption. It leads us, as it were, by making captive first our sense of seeing or of hearing or our imagination, and thence, through the unity and intensity of its interest, our whole consciousness, until like the children of Hamelin we forget all else and follow. But our enjoyment of fine art differs from our enjoyment of sleep. The enjoyment of fine art is the enjoyment of repose, it is true, but even in this repose there are a sort of activity and a full consciousness. When we are enjoying a lyric or a musical rhapsody or a symphony of color, we are living as intensely as at any other time, but our life is being led, and is simply free of the conscious effort of living.

The scope of this essay is to make clear the nature of fine art. It is not its purpose, however, to rehearse any justification of it. Fine art, it is true, does not appear to minister to any of the primal needs of food, raiment or shelter. We cannot here discuss the question as to whether or not man has any real needs other than these three, which, to be sure, he shares with all the higher animals. True it is, however, that the oldest relics of man's handiwork that have come down to us are examples of his fine art, and true it is that he has never ceased to paint and sing nor to admire and listen even to this day. George William Eggers.

Fine Arts, History of. A complete history of the fine arts, under which head we must include such forms of expression as architecture, sculpture, painting and decoration and the handicrafts, would at the same time be a history of the development of the esthetic, intellectual and religious nature of the human race. It would need to be considered in its relation to its primitive development, its climax and its decline.

Certain typical phases belong to the art of all races and individuals, and it is only these typical phases that can be clearly demonstrated in special cases that will be touched upon in the brief treatment that is necessary here.

It seems to be true the world around that pictorial expression was first of all a means of communication and was, as nearly as possible, representative of the object depicted. Gradually the truth to the object's form was replaced by some character that became the sign of the object. From these developed the characters that, finally, were used in the various alphabets. In the childhood of the race the tendency is to interpret natural phenomena in the terms of personal experience; and we find records of this personification and symbolism in both the construction and decoration of articles used in religious ceremonials and in the things of every day utility.

At first what seems to be decoration is not such in a strict meaning of the term, but is rather significant of a religious thought or is propitiatory in character.

Art in its strictest sense can only be said to begin when there is a distinct reaching out for the expression of beauty in the form of the thing created and when there is added to this endeavor the effort to make the form more beautiful by means of a suitable decoration. Symbolic use of decorative forms frequently precedes, by many generations, the studied effort so to use them that they are subordinated to the object, and frequently we find decorative forms, in the later phases of art, that have completely lost their significance.

In the decadent period of all arts we have finally lost both the symbolism of decoration and art-forms and the sense of its fitness, and find in their places a scarcity of originality and a realistic and frequently over-ornate use of natural forms. Any art that resorts to copying other forms, or to the copying of natural form for the sake of skillfully imitating it, has lost its inspiration and is in its decadence. At the present time we have, in the various countries of the world and among the barbarous and semibarbarous races, art in all its stages of development.

ORIENTAL ART.

Japanese Pottery. Probably there is no other place in the world where art is so much lived and lived with as in Japan. Every article of religious, military, domestic or personal use is produced with a special view to its being beautiful, not only in workmanship, but in its design and its adaptability to its use, by a class of artisans whose craft has descended through many generations. and thus represents an accumulated skill that is quite impossible under the factory-conditions which force each workman to execute only a part of the product. Things do not go out of style in Japan. The few things that are necessary are chosen with the utmost care, and, being hand-made and well-made, last a long time. The Japanese excel as metal-workers, enamelers, lacquerers, wood-workers, textile-makers, printers and potters. As space is so limited, the last named craft is the only one which will be treated here.

Japanese pottery is distinguished for refinement of form, varied and wonderfully executed design and unparalleled range of color. The most famous potteries are those of Arita, Kyoto, Kaga, Satsuma and Awari. Satsuma and Arita have produced both pottery and stoneware that compare favorably with anything of the kind that has been made anywhere in the world. The rudiments of this art as of many others were learned in China, and the Chinese influence is frequently traceable in the design. Japan is richly endowed by nature with all the materials in the form of clays and minerals that are used in the making of pottery and its colors, both of which they have used in bewildering variety.

In the 13th and 14th centuries there was a preference for the iridescent black, red, brown and dark-green of the Raku ware, but late in the 16th century, when the tea-ceremony became popular, taste in the matter of pottery underwent a marked change. Ninsei founded the kilns that produced the Awata, Kiomidzu and Omura wares. Ninsei was very skilled in the use of the brush, and decorated his wares with birds, flowers and human figures in creamy blue, light green and coral glazes. Kenzan and Yeiraku were famous potters who worked during the latter part of the 17th and the early part of the 18th century. Both were great colorists, but somewhat neglected form.

Japanese pottery can best be identified by its color. A soft gray-green is characteristic of the kilns of Sanda Seiji; grays and salmon of Haji; yellow-brown of Oki; and drip-glazes of Oriba. Satsuma is the most popular of all. It is famous for its soft, creamy-white backgrounds that are like old ivory and for its soft colors and gold. The 19th century produced the Bizen ware that is remarkable for its wonderful metallic brown and blue glazes. At the present time the development of pottery is at a standstill, and many of the kilns are producing inferior articles for the foreign market. See Bower: *Japanese Pottery* and Hartmann: *Japanese Art.*

Japanese Painting and Sculpture. Sculpture and painting may be said to have had their beginning in Japan between the seventh and ninth centuries A. D. They were derived from China, as were the initial movements of all Japanese culture. The earlier phases both of painting and sculpture show, very distinctly, an Indian influence, and this is explained by the fact that Japanese art had its inspiration in the introduction of Buddhism that came into Japan from India through China and Korea. The native religion was Shintoism which is little more than a system of ancestor-worship. Its sacred colors were red and white, and its temples were extremely simple in construction, with no decoration worthy the name, and contained little else than the sacred mirror. Hence this form of worship offered few inducements for the development either of an architecture or design. Buddhism, on the other hand, had a well-developed ritual and an organized priesthood, and was rich in its system of symbolism of form and color.

We find that sculpture, except as it is used in decorative wood-carving, was not a natural means of expression, and it was soon abandoned in favor of a form of art that could be expressed with the writing-brush. Sculpture, therefore, must be placed early in the history of this art. It is restricted, almost entirely, to huge bronze statues of Buddha, prominent among which are the Buddhas of Nara and Kamakura, the latter of which is a seated figure nearly fifty feet high. It was completed in 1252, while the former was finished in 750. Besides these and other colossal bronzes there are many gigantic wooden temple-statues of Buddha and other gods and goddesses. This sculpture is frequently very vigorous in treatment, and emphasizes spirit rather than form. The sculptured decoration of the temples and temple-furnishings is lavish in its design as well as in its use of symbols and color.

The painting of Japan may be classified into seven distinct movements, namely, the Buddhistic from the ninth to the twelfth centuries; the Yamato-Tosa from the tenth to the fourteenth century; the Sesshiu from 1421 to 1507; the Kano from 1400 to 1750; the Okio or Shijo from about 1750 to the present period; and the Ukioye from about 1640 to the present time. The last-named school, which produced the color-print, will be treated in an article by itself.

The Buddhistic school produced most of the sculpture of Japan and represents the first attempt at painting. It was exclusively ecclesiastical in character, and was strongly influenced in spirit, treatment and color both by India and China. Its greatest artists were Kanaoka and Hirotaka, both of whom painted temple and palace-decorations. Its colors were rich blues, reds, greens and gold.

The Yamato-Tosa school, though classed as one, was in reality two different movements, the first of which was distinctly Chinese in its origin, while the latter was thoroughly Japanese. Most of its great paintings depict various phases of Japanese feudalism, the life of the court and of the soldier. The paintings of this school and those of the others, too, are almost incomprehensible to the foreigner. The western painter tells what he has to say in such a way that the scene, person or thing represented almost lives before our eyes, their form is so accurately painted. The oriental artist, on the contrary, is not trying to paint things realistically, but is trying to make us feel his poetic emotion by painting the merest suggestion of the form with the most beautiful lines and color at his command. He does not attempt, for instance, to imitate a cherry-blossom that he has plucked from the tree and brought into his studio as a model, but rather the life and spirit of all cherry-blossoms that he has gathered through all his life of loving observation; and so he paints what he considers the life and spirit of the landscapes, human figure and other things.

We frequently find in reproductions of the paintings of this school, the originals being very rare, the artist painting in such a way that the observer feels himself to be looking from a point above the scene; and where houses are shown, the roofs are left off, so that one looks down into the interior as well as seeing the outside at the same time. Many of the later artists of this school are represented by exquisitely dainty and idealized drawings of flowers, birds and other natural forms.

Among the prominent individuals of the Yamato-Tosa group are those of the members of the Minamoto and Mitsumoto families; and, later, Nobuzane, a great colorist, Mitsunobu, Mitsuoki and Mitsuyoshi. Tosan color was a new development, quite independent of that of the Buddhistic school. The predominating hues were gold, white, red, green, yellow and blue, which were used intensely strong, but so broken up and woven together that the result was not glaring but a rich, softened gray.

The next two schools were nearly contemporary, and their inspiration was Chinese. They were the Kano and Sesshiu schools, the former of which was founded by Cho Densu who tried to paint in the style of the Buddhistic artists; his successors, however, abandoned this idea and established a new style which was based on the brush line drawing of China. These men were great designers, and worked for many years in black and white exclusively, but later added color in imitation of the Tosa school. The masters of this school excel in technique of the brush as well as in design. They painted panels in which, as themes, they used animals, birds, fish, flowers and trees. Its great masters were Kano Motonobu, Kano Massanobu, Tanyu, Yeitoku and Korin, who is sometimes accounted the founder of an independent school. Korin was a master designer, lacquerer and colorist. Sesshiu was the founder of the school that bears his name. He studied in China, and he and his followers had ideals, and used a technique and subjects, that were similar to those of the Kano school.

The Okio or Shijo school, known as the naturalistic movement, was founded by Okio who aimed at realism in painting and dealt with such subjects as birds, fish, flowers, trees and landscapes. This realism was not the same as that of the western world, which always draws an individual thing in a given moment and light, but was rather a truth to nature that was the result of so thorough a knowledge of nature that it was possible to draw any of her forms without having the thing actually present as a model. Sosen, one of the artists associated with this naturalistic movement, was famous for his paintings of monkeys.

In later years the artists of Japan have been diverted from the development of their national ideals of art by an interest in the art of Europe and of America. There, however, are two men still living in Japan, who have endeavored to maintain in their own painting what is best in the ideals of Japanese art; they are Hashimato Gaho and Ogato Gekko, the former the chief professor in the Tokyo Academy of Fine Arts. See W. Anderson: *Pictorial Arts of Japan;* Lafcadio Hearn: *Glimpses of Unfamiliar Japan;* Sadakichi: *Japanese Art.*

Japanese Color-Prints. Although the Japanese have developed the process of color printing by means of engraved wood-blocks to a point of excellence beyond that attained by any other nation, they themselves do not class them as art, and their creators are considered nothing more than artisans. Perhaps this was because the painting and sculpture were under the direct patronage of the upper classes and dealt with subjects which touched only upon the ideals of culture which were a sealed book to the common people; and because the print-school from the very first sought to portray the life of the people and actors and other classes which were not recognized by those of higher rank. In fact, they seem to have chosen such subjects as would be appreciated by those who had not the means to purchase the examples of higher art. These prints, some of which now are sold in Europe and America for several hundred dollars, cost only a few pennies in the streets of Tokio at the time they were printed. Aside from the wonderful technique, their marvelous design and harmonious color have been the source of inspiration to more than one western artist, among whom we may mention Whistler and Monet.

There were three persons who were concerned in the production of a Japanese print. They were the artist, the engraver and the printer. The artist drew the design on thin transparent paper in outline, indicating by notes what colors were to be used and where they were to be placed. These outline-drawings were then turned over to the engraver, who pasted them face-down on blocks of cherry-wood, which was always cut with the grain. With a very simple set of knives, chisels and gouges he cuts around these lines and chips out the wood between them, until only the lines of the artist's brush are left as high as the surface of the block. Several prints are made from this line-block on transparent paper, which in turn are pasted face-down on other pieces of wood, from which are engraved blocks for each color which is to be printed. These various blocks are then turned over to the printer, who mixes his vegetable color with a thick rice-paste, and applies it to the block. Without moving the block on which he has spread his colors, he applies a moistened piece of paper, which he pats down on the colored block until it has absorbed all the color. This process is repeated until all the colors indicated in the artist's sketch are printed.

Wood-block printing in black and white had been practiced in China for many centuries in the printing of the text and in the illustration of books, and it was in that way that it was first used in Japan. In the earlier stages of the art color-pictures were printed in outline and then colored by hand. Gradually the process became perfected, until it was possible to print most delicate and intricate designs and get any desired effect. The great works in Japanese color-printing were nearly all produced between about 1680 and 1850, since which time the art has been in its decline.

A few of the great print-artists in chronological order are Hishikawa Moronobu, Suzuki Harunobu, Katsukawa Shunsho, Torii Kiyonaga, Utamaro, Utagawa Toyokuni, Hokusai, Shunsen, Kunisada and Hiroshige. The most universal genius of them all, no doubt, was Hokusai, who at once was a painter, designer and print-artist. He, more than any of the other of these craftsmen, is recognized by his countrymen, who, however, never could quite forgive him for the vulgarity of the subjects he chose to paint. Hiroshige is famous for his landscapes. Excepting Hokusai, he was the only one of the print-artists who treated the landscape in any other way than as an accessory for their figures. See E. F. Strange: *Japanese Illustration* and William Anderson: *Japanese Wood-Engraving.*

Chinese Painting. Chinese pictorial art, when compared with that of Egypt, is modern, whereas in relation to Japanese painting it is quite ancient. There seems to be no trace of any native Chinese art of this kind previous to the time of the introduction of Buddhism into China, whither it came from India during the reign of Emperor Ming in 62 A. D. There are records, between that time and the seventh century, of paintings of dragons and of Buddhist gods and goddesses that were made for the decoration of temples. In the eighth century there were two famous painters who were employed to do some decorative work for the government. The Sung dynasty between 960 and 1206 had many painters, among whom were Li Lung-yen (or Ri-riu-min as the Japanese know him) and Ngan Hwui (or Ganku in Japanese). The former was famous for his Buddhist pictures, his drawings of landscapes, horses and the figure. He is represented in the British Museum by a painting called *The Nirvana of Sakyamuni.* The latter was known as the last of the great masters who so strongly influenced Japanese painting. The Yüen dynasty between 1206 and 1450 had some noted painters of horses, tigers and birds, the most famous of which perhaps, was Chao Meng-fu whom the Japanese call Cho-su-go. The Ming dynasty between 1450 and 1628, like the Yüen, shows almost an absence of religious paintings, but many landscapes, birds, flowers, animals and figures.

In China, painting was a direct outgrowth of writing. For centuries the greatest admiration was felt for the ability to write beautifully; and to write Chinese is to be able to control the brush to a degree that is impossible to an occidental. In learning to write, the Chinese learn to master the mechanical part of the painter's art, and it only remains for him to draw objects instead of the characters of writing.

The Chinese painter cares little about representing things as they look in the truth of light and shade, perspective, etc., but tested his work by the character, directness and vigor of the lines used. There were three ways of painting: by the use of line alone; by the use of line and mass in monochrome; and by the combination of line and color. The Chinese painted both on paper and on silk, on which they used either ink or an opaque water-color of very durable quality. The Chinese painter applied his art to such crafts as wood-engraving, decoration of pottery, lacquer and embroidery.

While the painting and sculpture of China furnished the inspiration of those arts in Japan, they never reached the high state of development that they did in the latter country. Literature, to the Chinese, seems to be the more natural medium of aesthetic expression. See William Anderson: *Catalogue of Chinese and Japanese Pictorial Art.*

EMMA M. CHURCH.

EGYPTIAN ART

Egyptian Wall-Painting. Egyptian wall-painting is symbolical and decorative. Its first object was to tell the story of the king's life, public and domestic, his battles, triumphs, religious ceremonies and sacrifices and festivals. He was believed to be a relative of the gods, and therefore received devout tribute and praise from his loyal underlings. He made the laws, was the judge and declared war; in fact, everything was under his control.

Secondly, this painting was to decorate the wall-surface. It was always flat, never giving the effect of light and shade and never showing any perspective. The face of a human being was always painted in profile, while the shoulders were drawn in full front-view; and, again, the body was so twisted that the legs and feet were in profile. The feet and hands were always drawn flat. The drawing of the lower animals shows much more truth in portrayal. In most cases the artists caught the characteristic movements. In depicting landscapes the surface of their wall or paper was considered like a map, except that everything was drawn parallel to the picture-plane. Zigzag lines represented flat water, a tree a forest and a fortress a city. Flower-forms always were drawn generally and never in the particular (conventional as some may choose to term it), and used with great skill as decorative motives.

In composing, in order to make one figure the principal spot of interest, the artist drew it very much larger than all the rest. Hence we always find the kings like giants amongst pygmies when compared with their followers. The drawings were all made in outline and the enclosed spaces filled with bright color. The paintings were in most cases put upon the stone buildings, the pylons and the enclosing walls of the cities, temples, etc. Here the sculptor carved the outline in the stone, and then the color was applied to the drawing. The interiors of the tombs were always decorated in brilliant color, to brighten and enliven, and told the story of the deceased's domestic life. At first, in the painting, the story was merely told by the hieroglyphics with color painted into the cuts, but later these stories were illustrated with symbolic pictures and flat color, and later were drawn not only upon stone but on various materials, as the wooden lids of mummy-chests, papyrus, etc., with an outline of black chalk or coal; and finally the bounded space was filled with color mixed with gum-water. See, also, PYRAMIDS; TEMPLE OF LUXOR; TEMPLE OF KARNAK; SPHINX and RAMESSION.

ASSYRIAN ART

Architecture. Assyrian architecture is so closely allied with that of Chaldea or Babylonia that it is difficult to separate them. We might consider the two in one great style, as it is only by comparing the ruins of one with those of the other that we can make any headway in our study.

The Chaldeans in the valley of the Tigris and Euphrates, being overthrown by an invasion from the west in 1518 B. C., gave the Assyrians a chance to rise to supremacy and in 1273 B. C. they founded the great kingdom of Nineveh which held the ruling power for six and one half centuries in Asia.

The ruins of the buildings of these people are little more than undiscernible heaps of clay, except those found at Persepolis which are fairly well-preserved. Their almost complete destruction is due to the lack of any natural, durable material and to the lack of fuel which made fired brick very costly. Wood and stone had to be carried long distances, and therefore were very expensive and usually used only for ornamentation. Hence we find little refinement of form, no system of colonnades, no overhanging cornices or the like. Sun-dried bricks of clay, made of the viscous, adhesive soil, in blocks 12 x 12 x 2 or 4 inches were the most usual building-material. These bricks were often put into the building wet from the molds, and allowed to bake in the structure. Sometimes lime and mortar were used as adhesives, but usually only bitumen.

The most important and distinguishing feature of this early architecture of Assyria is the wagon-vault or tunnel-vault, a prolonged arch of sun-dried bricks, raised obliquely from the walls and used to roof long halls, rooms, sewers and drains. In the rooms at brief intervals there were higher vaults for the admitting of light and air, shaped like semidomes. Fire-brick was used as an inner facing in the drains.

Columns were not commonly used, though sometimes they are found constructed of brick or sections of sun-dried clay. Galleries raised on columns for the admitting of light have been discovered.

The most important buildings were palaces, hanging gardens and temples. No tombs have been discovered, unless it be the pyramid of Nimrud, a massive structure without stairs or inclined plane, but nothing certain is known about its use.

The Assyrian structures were built upon terraces or in the form of terraces to which flights of steps or long, gradual slopes gave access. The walls were unbroken, except by towers where defense was necessary, and of uniform height. The temple terraces were of many colors according to their religious symbolism.

Sculpture. Assyrian sculpture was decorative and in most instances done in bas-relief. The artists show great freedom of method, but were bound to certain conventions by religion and royalty; hence there is little poetry in their work. The Assyrians seldom departed from incidents in their religion and in the life of their king. The sculptor was the historian and pictured the king, who is rarely seen alone, in his victories, triumphs and hunting trips. In this sculptured history the king is shown leading the procession of warriors followed by the priests, judges, common people, horses, etc.

The sculptor uses one type of man throughout, the king being recognized only by his curled hair and beard, high tiara and costly attire. In the same way his followers are known by their dress.

Above the kings are the composite beings with human features, signifying intellect, and body and wings, types of brute-life, signifying power and strength. The most common of these creatures were the winged bulls, having human faces with curled hair and beards and wearing high tiaras topped by a crest of feathers. There were others, gods represented by combination of parts of various birds and animals, but nearly always having the faces of human beings. There also were evil spirits which were always hideous assemblages of the lower forms of life.

Sculpturing in the round was usually employed to represent the gods only, although in rare instances the king is so modeled, when he is walking alone.

The lower animals were always a source of inspiration to the Assyrian artist, who carved and chiseled them with a truth and precision that are surprising when we compare them with their study of the human figure.

Assyrian sculpture was done for the most part on slabs of soft alabaster and limestone, and was in nearly every case used for interior decoration. Sculpture in Assyria was cut short in its development by wars, so that no rise and decadence are shown, but rather a slow but steady progression.

Pottery. The Assyrians were well-advanced in the art of making pottery, as clay was their chief material for artistic expression. Brick-making may be classed under this head, (see ARCHITECTURE). The bricks were large, usually square and of two kinds, sun-dried and fire-baked, the former being used mostly for heavy building, while the latter usually were applied as decoration. These fire-baked bricks were frequently covered with brilliant colors and enameled with copper. Flowers, rosettes, palmettes, chain-patterns, subjects of the chase, men, animals and trees were painted into the enamels, and each brick bore the name of the king.

The literary productions of the land were inscribed upon bricks, tablets, vases, etc., and collected in large libraries. Many of these records are in existence to-day and fairly well-preserved. They are written in cuneiform, and contain valuable writings and accounts of the life of the people, verifying many of the stories of the Bible.

Few vases are found, except large urns that were commonly used for coffins.

Painting. Very little is known of the painting of Assyria, but traces of color have been found on the bas-reliefs, wall-decorations and terraces. In the latter each terrace was painted a different color, according to the phase of worship to which it was devoted. Pins of clay were pressed into the interior walls of buildings while they were still soft, forming interesting design-arrangements, and then colored in various schemes. This shows that the art of painting was not entirely unknown, but the perfection that it attained can only be guessed at.

GREEK ART

Sculpture and Pottery. The period of primitive sculpture in Greece was previous to 1000 B. C. In the Mycenæan age the temple-decoration depended upon fresco-painting and incised cement floors, and there was very little sculpture. The gate of the citadel at Mycenæ (1500 B. C.) displays a relief of two lionesses with their forepaws resting upon an altar. Dignity and power are expressed in every line of their angular bodies, and one turns from the contemplation of the woolly manes and lashing tails of modern forms, to these simple, archaic beasts with keen delight. Mycenæan pottery was the leading lucrative form of modelling. It was so varied and attractive that desire for pottery was stimulated. When Athens and Corinth became rivals in this industry, Greek wares migrated all over Italy as well as the Orient. The Greek vase illustrates the history of the country a thousand years previous to an authentic written word. The designs were first marine and then geometric, and the colors lustrous reds, blacks and browns. Mythological subjects predominate, and the religious teaching of vase-pictures from the first to the last chapter of Greek theology is incalculable. The majority of vases were adapted to household needs such as the amphoræ for storage; the hydria for drawing and carrying; the lekythos for pouring; and the kantharos for drinking. Primitive sculptures at Selinus interpret the Greek idea of strength in short legs, thick bodies and exaggerated muscles. A perpetual smirk, supposed to indicate joy, is found on the round faces with their bulging eyeballs and spiral twists of hair.

The transitional period is illuminated by such productions as Myron's *Discobolus* and the pediments at Olympia. The *Discobolus* is a bronze of a young Greek throwing the disc. In the face and form we have the generalized type of masculine beauty and grace which had reached its height at that period. The art of Myron was not obscured by that of Pheidias, for the sequence of productions in Greece flows on like a splendid river, where each bend or turn lends a charm all its own.

The architectural feature of the age of Pheidias was the Parthenon, the Doric temple of Athene, the patron goddess of Athens, as well as the treasury of Athens. It was the background for the most important group of sculpture the world has known.

The Panathenaic (all-Athens) procession was a celebration of civic pride, combined with religious sentiment. Therefore, it was logical that Pheidias should choose the subject of this procession for the magnificent sculptured frieze within the portico. The exquisite grace of the maidens who lead the van, the spirited steeds and athletic figures of the young men, the whole play and movement of this wonderful presentation in marble are indescribable. The remnants of the frieze and fragments of two splendid pediments are housed in the British Museum, but only a supposed model, combined with historic descriptions, suggests the beauty and grandeur of a statue once within the building.

This figure of Athene was thirty-nine feet in height and of wood and stucco. The flesh-parts were covered with ivory, with eyes of painted marble to imitate nature. The hair and draperies were of solid plates of gold, so made as to be removable in case of war and yet leave the figure uninjured. It is said that eight statues of Athene were executed by Pheidias, as well as the colossal figure of Zeus at Olympia.

Writers declare that in this last work the sculptor reached the climax of portraying divine excellence, serenity and joy. The ruling power with Pheidias was the ideal; with Polykleitos the sublimest beauty is the real, but in Praxiteles we find the sculptor of gods, not men.

In a room at Olympia, especially designed for its occupancy, stands the *Hermes* of Praxiteles, the most beautiful of marbles. The smile of the mobile mouth is as gentle, the curling locks as crisp, as when the master sculptor gave the last touch to that serene brow. To see it is to know that the essence of divinity has manifested itself in a materialized thought.

The important sculptures of the Hellenistic period were the figurines in terracotta found at Tanagra and three statues in marble. These three matchless works are the *Apollo Belvedere* in the Vatican; the *Venus of Melos;* and the *Victory of Samothrace* in the Louvre. The last is the most interesting of all, for, headless and armless though she is and though poised at the top of a flight of stairs instead of upon the prow of a ship, she seems to rush onward, her vibrant wings spread to meet a fresh sea-breeze. See A. S. Murray: *History of Greek Sculpture;* F. B. Tarbell: *History of Greek Art;* and J. H. Huddilston: *Greek Pottery.*

Gothic Architecture and Sculpture. Greek temples are beautiful without, Moorish mosques within, but the Gothic building is beautiful both within and without. It stands as an expression of the freedom of thought between feudalism and the crusades. It was the result of the brotherhood of Masons, who, together with the clerical authorities, desired to build royal monuments to one living and ever-present God. Because of this the great Gothic cathedrals have eternal youth. "Gothic implies a building in which stone vaults are supported by a framework of independent ribs." This skeleton is supported vertically by heavy piers, and the combination is prevented from falling in or out by thrusts in the shape of arches and buttresses, that distribute the weight of the vaults and ribs.

Walls proper scarcely exist, because the usual wall-space is occupied by enormous windows above the ground-story of the exterior and within by colonnades. Huge outer abutments are the bases for what are called the flying buttresses. These are a form of arch which rests at one end on an outer pier, while the other presses against the upper or clerestory. The flying buttress, the skeleton-framework and the prolific use of the vertical line are the characteristic features of Gothic art. Among the most important examples are the French cathedrals of Chartres, Amiens, Beauvais, Rheims and Notre Dame de Paris; the English cathedrals of Lincoln, York, Winchester and Canterbury; the German cathedrals of Cologne and Strassburg; and the Italian Duomo at Milan.

The notable feature of the perfected Gothic, which is found in France, is its adherence to fixed structural laws. In the other countries features have been added that are neither useful nor more beautiful than the French plan, but lend a local touch to the edifice.

The square east end of the building and the lancet, decorated and perpendicular styles of windows are peculiarities of English Gothic. Moreover, some of the churches have timber-ceilings instead of stone-vaults. Another innovation is called stellar vaulting, when the ribs are so numerous and so arranged as to form a star.

It is said that the towers of Chartres, the nave of Amiens, the choir of Beauvais and the doors of Rheims would make a perfect building.

Gothic sculptures are at their best in France, where unity of style is essential. Not only are the sculptures plastic histories, but the manner of handling the figures corresponds with the adjacent lines, angles and curves of the building on which they are placed. Thus the realistic gives place to the harmonic. The lines on the male figures are often so elongated, in order to express dignity and to harmonize with the surrounding, as to lose in beauty when judged as a single work of art; but, as only a unit in the whole building and seen from a little distance, the perfection of taste displayed is obvious.

The typical motive in English and German decoration is the leaf-form. This grew from the trefoil or three-lobed grape-leaf (emblem of Christ) to naturalistic copies of oak, maple, lettuce, carrot-leaves and fruit. Leaves in flame-shapes to correspond with the flamboyant style in building were found on English structures, and nothing could be more charming than the foliage carved in the stone of Strassburg.

Gothic design prevails in all European wood-carving as well as in the productions of metal-workers. Grotesque sculpture, as expressed in the gargoyles (rain-spouts) of cathedrals and in freakish heads of men and beasts, as illustrated in the numbers that fairly ripple over the walls of Rheims, are to be taken seriously when their symbolic meaning is understood, for they are supposed to represent the various forms adopted by the Satanic horde when expelled from the sacred precinct by the heavenly host. See *Cathedral Cities of France* by H. M. Marshall; *The Cathedrals of England* by F. F. Bumpus; *Gothic Architecture* by Francis Bond; and *Great Cathedrals* by E. A. Brown.

BYZANTINE ART

Architecture, Sculpture and Painting. Byzantine architecture which is sometimes called eastern Romanesque, like the western Romanesque was a further development of the older Roman style. The geographical position of Byzantium, being the same as that of the modern city of Constantinople, made commercial communication with the east both natural and easy, and this was the means of bringing the art and culture of the orient to the notice of the western world and the reason that we find in Byzantine architecture the fusion of the structural and decorative characteristics of both Rome and Asia Minor and the far east. From Rome the Byzantines borrowed the use of heavy buttressing, either on the inside or the outside of buildings, the use of monolithic columns and the incrustation of walls and piers with panels of marble and rich decoration of mosaic. From the east they obtained the idea of their vaulting and the style and treatment of their design.

The most characteristic feature of Byzantine building is the prevalent use of the dome and the construction of the dome on what are known as pendentives, which made it possible to surmount a building having a square ground plan, with a circular dome.

This may be more easily understood, if we can imagine a large hemisphere resting on four piers or vertical supports, then supposing that four vertical sections, in the same plane with the sides of the square made by the four piers, are cut in the hemisphere, leaving four semicircular arches, one spanning each pair of piers. Then we may imagine a horizontal section cut from the top of the hemisphere, leaving triangular sections of a sphere between the four arches and the horizontal section, which are the pendentives. Sometimes a hemispherical dome rested directly upon this horizontal opening but in later buildings a cylindric crown was built around it, in which windows were made, and on this crown was placed the final dome.

Byzantine buildings were almost exclusively ecclesiastical in character, and made use of a wide variety of ground-plan, such as the circular, octagonal, Greek cross and oblong.

The exterior of the buildings was severely plain, having only bands of a lighter or darker marble to mark the stories of the structure, but the interiors were very rich in colored decoration in painting and mosaic as well as in sculptured design. The painted decoration was used in the smaller buildings, while in the larger ones is found most gorgeous embellishment of mosaic in the richest of color and gold, in which were depicted biblical scenes, saints and symbolic figures. Set patterns, monograms, crosses and other symbolic geometric forms were also wrought with great beauty. As early as the 5th and 6th centuries the Byzantines had developed a beautiful and individual style of sculptured decoration, which was usually in very low relief and gave a lacelike and charming effect to surfaces. The acanthus and anthemion were the most common forms used in carved decoration, but they were treated in a new and individual way.

The greatest monument of Byzantine architecture and one of the masterpieces of building of the world is the Hagia Sophia, which was originally a Christian church built in 532 A. D. by Justinian, but which is now a Mohammedan mosque in Constantinople. In Constantinople, also, is located St. Sergius, another example of Byzantine architecture. This building, like San Vitale in Ravenna, has an octagonal ground-plan and is surmounted with a dome.

Byzantine art spread its influence far and wide and until the 12th century and, in some places, until much later, it dominated the art of the Christian world. In Venice is an example of this influence in St. Mark's. In Russia, where we find the fantastic bulbous dome, and in Greece the Byzantine style of building has remained the approved style of the Greek Catholic church. There are buildings of this type in Greece, on Mt. Athos and in Athens. Probably the most marked influence it has exerted is on Mohammedan architecture even to the present time. See *Hamlin's History of Architecture.*

ITALIAN ART

In Italy have arisen and developed three successive styles of architecture, namely, the Roman, the Byzantine and the western Romanesque. Each of these has produced its own distinct type of decorative painting and sculpture. We have treated Byzantine art under a separate head. Italian painting and sculpture, which belong more particularly to the last named style of architecture, will be dealt with in detail in the biographies of the artists of the renaissance, which is said to begin with the work of Cimabue, who is called "the father of modern painting," in the 13th century.

Cimabue and especially his pupil and successor, Giotto, tried to break away from the traditions of the church that had fettered the Byzantine painters and sculptors; and they gradually grew toward a representation of the human figure that had grace and beauty as well as more truth of drawing.

There were two great centers of culture and art that produced the majority and the greatest of the Italian masters. These centers were Florence and Venice. The Florentine school comprised such artists as Cimabue, Giotto, Masaccio, Fra Angelico, Botticelli, Raphael, Lionardo da Vinci and Michael Angelo. The Venetian school claims the two Bellini, Titian, Veronese and Tintoretto. Montegna came from Padua, Corregio from Parma, and Perugino with a group of students makes up the Umbrian school.

Venetian Architecture. Situated halfway between the Byzantine and Franconian empires, Venice became the market-city of exchange between two powers. Artists from the east and west were drawn to this great bazar, and native workers accompanied the ships that pillaged oriental cities of materials and ideas. The Venetian artisan was clever enough to learn the secrets of many trades, and imitated them,—to the gain of decorative Venice. The architects and builders had not the severe and practical training of the Pisan and Florentine. There was no internal warfare in the republic, and therefore no need of household fortresses. Therefore the Venetian seized upon the picturesque and fantastic styles in others, and grafted them upon a building suited to his needs. For instance: Venetian palaces face canals; some on cross-intersections of waterways: therefore angle-windows were introduced, that the owner might have two views. These were faulty in construction,—but how convenient! The useless screen over *Ponte del Paradiso* would be ridiculous, if it were not a gem of the sculptor's chisel. A lack of coherence is one of the marked demerits in Venetian building, although that is balanced by a keen sense of the picturesque.

Among the most important examples are the Byzantine cathedral of St. Mark; the Gothic palace of the doges; and the renaissance church of S. Maria dei Miracoli, where the evolution in type of construction is seen. St. Mark's, Venice, with its oriental columns, its sculptures, bronzes and mosaics, is a museum as well as a church, for here are found the spoils of battle as well as the symbols of peace. The mosaics are set to show a tiny rim of plaster; this opaque rim of white, combined with the bits of gold and colored glass, produces a glow upon the walls that is matchless.

The two lower arcades of the doges' palace are among the best in Europe, but the building is badly marred, because the third story, planned to rest on the back of the upper arcade, was brought forward flush with its front edge. The marble facing, however, of this despised third story is built into the wall, instead of being stuck on, as was usual elsewhere. The sixteenth-century library, built by Sansovino, with its double colonnade of open arches and embedded columns, is one of the finest secular buildings in Europe.

This edifice, with the cathedral and the ducal palace, forms a noble group about that heart of Venice, the Square of St. Mark. From the water-gate of this square Palladio's Campanile of San Giorgio cleaves the sky and is a bright foil to the great dome of S. Maria della Salute.

We embark and glide down the Grand Canal, with "glorified streets" in the form of bridges and lined with old palaces, showing the same fine distinction of style in Gothic or Renaissance, as their owners in family and position, and then the eye falls on one of consummate grace; so satisfying is it to a lover of pure beauty, that one knows instinctively that he looks upon

Casa d'Oro, the Golden House of Venice. See *Stones of Venice* by John Ruskin; *Venice* by Molmenti; and *Venice* by F. Hopkinson Smith.

GERMAN ART. Romanism ploughed its way across Germany at an early period, with the result that by the tenth century a large number of wealthy monastic buildings were established on or near the Rhine and Danube Rivers. However, no churches of great importance were erected before the eleventh century, excepting the octagon of Charlemagne at Aix-la-Chapelle and the Romanesque cathedral at Bamberg. The monks in the aforesaid monasteries painted exquisitely on parchment, and produced some interesting pottery and glassware. It was not until late in the thirteenth century that Gothic art in its perfected form appeared, and culminated in Cologne cathedral. The Saxon city of Dresden was the cradle of Rococo art with the Zwinger building as an illustration of this period in its most exaggerated or baroque style. By way of the Meissen potteries, in the neighborhood of Dresden, the rococo garlands and scrolls, as painted on china, migrated from country to country and became a familiar and popular type of decoration. Berlin is the center of huge government and private palaces where the work of the distinguished architect Schinkel has been enthroned. Yet neither city could command the same unqualified approval from art-critics in general as the old town of Nuremberg, with its lofty dwellings peppered with quaint gable-windows, and the possession of that group of men known as the Little Masters.

To understand German stonecutting, one should study the carvings on the church of St. Sebaldus, Nuremberg, executed in the fifteenth century by Adam Krafft. To appreciate something of the endless and minute labor expended upon a single monument, days should be spent in examining the bronze shrine of the saint within the church, the work of Peter Vischer and his five sons, who were thirteen years modelling it. A crucifix and several large reliefs in the choir by Veit Stoss exhibit master-carving in wood, which is one of the leading German crafts. The greatest of German artists, of the Nuremberg masters, was Albrecht Dürer (1471–1528) painter, engraver and goldsmith, whose nobility of character and versatility of talent place him on a pedestal of fame that will never topple over. The two Holbeins rank next in importance to Dürer; Hans Holbein, court-painter to Henry VIII, was a strong technician and a fertile inventor. His pictures of home-life are charming and versatile.

Among the modern masters of Germany are Schwanthaler (sculptor) and Cornelius, Overbeck, Von Kaulbach and Richter (painters), who were the proteges of kings and the idols of the people. The heroic bronze figure of Bavaria by Schwanthaler is a metal epic that dominates Munich, now the art-center of the empire. Cornelius and Von Kaulbach have executed important modern wall-decorations, and Overbeck's group of large engravings of the *Life of Christ* is a national treasure. No pictures of children's faces are purer or sweeter than the lovely composition known as the *Song on Christmas-Eve* by Ludwig Richter. A new school called the Sessionists has sprung into being and met support, and Franz Stück has been the leading spirit. See *History of Art* by Lübke; *Gems of Modern German Art* by Scott; *Northern and Southern Germany* by Baedeker.

RUSSIAN ART

The churches of Russia, as well as some of the palaces, are stamped with Byzantine design, mingled with an exuberant local feeling that is barbarous, without being effective from a truly artistic viewpoint. At a distance the numerous highly colored and gilded cupolas, domes, spires and other bulbous projections, which are heaped upon one building, lend it the form of a vegetable bouquet. However, taken singly, nearly every one of the turnip, carrot or onion-shaped domes or towers, with its gilded or colored surface, is intensely interesting. There is a general disposition to build the central dome or tower unbroken from within, so that the wall-paintings of enormous figures may be carried up the funnel-shaped openings from above the congregation to the top. A succession of granite steps leads to the pompous portals, thus adding to the grandeur and solemnity desired by the builders. High, dark arches gleaming with antique gold spread like bats' wings above the many shrines which are spangled by ever-burning lamps. A huge iconastos or screen, composed of holy pictures, separates the congregation from the priests who may be seen officiating at the altars through doors in this screen. Innumerable icons are hung about the church with racks for candles. These sacred pictures are modeled after the ancient icons painted by Rublof, a monk of the fourteenth century. The pinched, wan faces are supposed to inculcate habits of piety and temperance. The faces and hands are painted, and the hair and clothing are composed of etched metal-plates. Every room in every building, from the palace to the tavern, has its icon, which is placed in a corner directly beneath the ceiling.

The most interesting examples of architecture in Russia are the buildings included in the Kremlin or Citadel of Moscow, the cathedral of St Isaac and the Peterhof at St. Petersburg and St. Sophie at Kief. The royal palace of Peterhof is situated on a hill which is a cascade of buildings, trees, fountains and flowers. Peterhof is a weak imitation of Versailles, and everything that could be gilded glitters and sparkles with the brightest of gold. Russia boasts one of the finest collections of art-works, installed in the Hermitage, and her painters are prominent exhibitors at the various salons of the world.

Among the notables are Répine, Aivazovski, Siemiradski, Makovski, Volkoff, Peroff and Verestchagin. Everyone who attended the Columbian Exposition will remember the *Russian Wedding-Feast* by Makovski, and Vasili Verestchagin's great battle-scenes are familiar to many Americans. No painter has accomplished so much to tear the veil of glamour from the awful face of war as this apostle of peace. We understand something of the dense forests, wide marshes and desolate coasts of this distant country, when we stand before the canvases of Volkoff, and we appreciate more the mingled pride and cruelty of the early rulers when studying Répine's marvelous rendering of that last scene between Ivan the Terrible and his son. See *The Tsar and his People* by Eugène de Vogüé; *Russian Art* by Alfred Maskell; *Studies in Russia* by J. C. Hare; and *Russian Art* by Viollet-le-Duc.

SCANDINAVIAN ART

Northern Europe is noted for its love of rugged outlines and bold, pure color. These traits are manifested in Norway and Sweden, where cliff and precipice reign permanently and the skies change from clear bright blue to stormy black. Denmark is a charming foil; here all is gentle and undulating, and the predominating color is a misty gray. Norway contains a number of very old timber-churches with lean-to roofs above building and porch and but four small windows. The interiors are lighted by lamps which give additional warmth. The houses of the nobility in Norway and Sweden are composed of huge timbers with plastered walls, which are painted in many colors. The elaborate dadoes and doors of the Crown-Prince's palace at Stockholm are typical of the national spirit in decoration. In Westgötland, Sweden, there is a castle where the arms of the family, accompanied by huge scrolls, are arranged about the main portal like a pyramid. The scroll and the dragon design are the two principal motives in Scandinavia, and are turned and twisted in every conceivable way. Inlaid wood is one of the arts, and may be seen at its best in some exquisite panels in the palace at Kalmar. The wainscoting of the Golden Hall in this huge quadrangular edifice is worth much to the student of design. Baroque architecture seems to have reached its height in Denmark, where dropsical figures are arranged about the doors and windows or sport as goddesses on ceiling-decorations. Bertel Thorwaldsen, whose grave is found in the court of the massive building where his sculptures are exhibited, was the leading sculptor of the nineteenth century. His love of Greek art gave his work a repose which had been entirely lost in the exaggerated style of the Rococo.

Danish painting is homely and precise, as one sees it in the productions of Eckersberg, in Vermehren's charming cottage homes, in Viggo Johansen's captured moments of real life. The historical painter, Christian Zahrtmann, searches for spiritual feeling and expression, and Kröyer paints the wooded coasts in soft bluish-grays indescribably Danish.

Since 1860, in Norway, great interest has been manifested in the promotion of a national art, and the typical men who paint in a rough, angular but healthy and frank manner have made themselves felt. We hear most of Wenzel Jörgensen, Kolstoe and Krohg, painters of fisher-folk, and of Fritz Thaulow, whose glitter of ice and snow and little red houses at Christiania are so delightfully familiar and homelike.

Swedish artists are the Frenchmen of the North. They paint with grace and spirit. Stockholm possesses several historical canvases by Roslin, who lived in Paris in princely style. The Swedish painter of painters is F. J. Hoeckert. The museum of Lille owns his masterpiece, *Divine Service in Lapland*. The ultra-modern Anders Zorn, who has painted many portraits of distinguished Americans, is best known here. His manner of handling the brush is independent and bold, and his perception of character and temperament is as keen as discreet. See *Dictionary of Architecture* by Russell Sturgis; *History of Modern Painting* by Müther; and *Norway, Sweden and Denmark* by Baedeker. A. S. HALL.

See, as representatives of French art, MILLET, COROT, MEISSONIER and others; of Dutch art, VAN DYCK, RUBENS, REMBRANDT; of English art, HOGARTH, GAINSBOROUGH, TURNER, MILLAIS and others; of American art, INNES, HUNT, WHISTLER, LAFARGE, SAINT GAUDENS and others.

Fin'gal's Cave, a cave or grotto on the island of Staffa, on the west coast of Scotland. It is probably named after Fingal, the Gaelic hero. The cave is 227 feet long and 42 feet broad at the entrance, and can be entered by small boats, the sea being 20 feet deep at low water in the cavern. It looks somewhat like a Gothic church, with its tall pillars and stalactites of many colors, and is one of the most picturesque grottoes known.

Fin'land (Swampyland or land of the Fens), a grand-duchy of Russia annexed by her in 1809. It is bordered on the north by Norwegian Lapland, on the east by Russia, on the west by the Gulf of Bothnia and on the south by the Gulf of Finland. Its population is about 2,900,000. The area of Finland is nearly 145,000 square miles, or rather larger than Great Britain and Ireland.

Surface. The country abounds in lakes, about a quarter of it being occupied by lakes or marshes, the largest being Lakes Ladoga, Saima, Enara, Kemi, Ulea and Päyänne. Lake Saima has an outlet into Lake Ladoga over the famous Imatra Falls, the finest in Europe, and is connected with the Gulf of Finland by a canal 36 miles long, which is considered a triumph of engineering skill, running through granite rock. Finland has no large mountains and only small rivers.

Natural Resources. Neither fossils nor coal are found, but there are remarkably fine quarries of granite and a large area of Crown forests. These give employment to over 21,000 timbermen and lumbermen. Of wild animals, there are bears, wolves, foxes, otters, hares and ermines; seals are plentiful along the coast; and reindeer thrive in the far north. Of birds there are 211 species, and in the rivers, lakes and seas are 80 known kinds of fish, including the salmon, trout, perch and pike.

Climate and Agriculture. The climate is severe in winter, 25° below zero frequently being registered; and the summer, though very short, is hot. Apples, pears and cherries are found below latitude 63°, and currants, raspberries and strawberries thrive everywhere. Of cereals, rye is the most known, then barley, oats and wheat.

Exports and Manufactures. Its chief exports embrace timber, paper, cardboard, leather, hides, tar, pitch, iron and iron products. Her manufactures give employment to over 100,000 workmen and yield an aggregate product (exclusive of four mills) of the value of 351,000,000 marks (about $71,000,000).

Government and Education. The country is governed by a grand duke, who is the emperor of Russia. There is a senate, nominated by the crown, presided over by a governor-general, which sits at the capital, Helsingfors (population, with Sveaborg, 147,369), and is the chief administrative body. Education is in a highly advanced state, no less than 91 per cent. of the adult population being educated. There is a university with 1,092 students. The country is divided into 16 electoral districts. There are 2,012 miles of railroads, almost all belonging to the state. The army consists of 5,400 men in time of peace and about 20,000 reserves. There is only a commercial navy, numbering 357 steamers of 54,556 gross tons, and 2,536 sailing-vessels of 297,758 gross tons burden. The financial condition of the country is good, its public debt being more than offset by the value of the state property.

History. The people of Finland, called Finns, are related to the Laplanders and to the Magyars of Hungary, and are entirely different from the Swedes and Russians. They are mostly of native Finnish descent, intermingled with the Scandinavian races. They are an industrious and honest people, though not very intellectual; tall and well-proportioned, with rather square faces, and belong to the agricultural class. In early times they were known as pirates, and formed an independent empire. Their attacks on sea-vessels so annoyed other nations that the Swedes undertook a crusade against them in the 12th century, conquered them, and converted them to Christianity. Sweden kept possession of Finland until 1809, when it was conquered by Russia. Of recent years Finland has rapidly become Russianized, and that in violation of the state constitution. In 1900 the Russian language became the sole official one; while Russia now insists on legislating in Finland, in defiance of the local *diet*, in all matters affecting Russian interest. As a result there has been much disturbance in the country, with several notable assassinations of Russian high officials, besides considerable emigration from it.

Finland, Gulf of, the eastern arm of the Baltic Sea. It receives the waters of the great lakes, Onega and Ladoga. Navigation is dangerous, on account of numerous islands and shoals.

Finns. See FINLAND.

Fir, a name applied to the true pines, larches and other small evergreens, more properly used to denominate the Norway spruce, the silver fir and their kind. There are about 12 species of the Norway spruce and about 25 or 30 of the silver fir. They are all evergreen-trees. The finest of European firs is the Norway spruce, which attains a height of from 80 to 150 feet. It yields resin, turpentine, tar and lampblack. In Sweden and Norway the inner bark is made into baskets, and the long, slender roots, after being boiled with alkali and sea-salt, are twisted into ropes. The wood is known in the market as the white Christiania deal and the Dantsic deal. Other well-known varieties are the black spruce, white spruce, red spruce and oriental fir. The hemlock spruce of North America is also well known. Its wood is not much prized, but the bark is valued for tanning. The Douglas fir attains a height of 250 feet, and forms immense forests in the northwest of America. The common silver-fir abounds upon the mountains of Central Europe and the north of Asia, and attains a height of 150 to 180 feet and an age of 300 years. It yields the clear turpentine known as Strassburg turpentine. The balm-of-Gilead fir is a native of North America, yielding Canada balsam. Spruce-beer is made from the small branches of the black spruce.

and the thread used by the Indians in sewing their birch-bark canoes is made from the roots of the white spruce.

Firdausi (*fĕr-dōō'sē*), **Abul Kasim Mansur,** was the first and chief of modern Persian poets. The date of his birth is uncertain; he died in 1020 A. D. His great epic was the *Shāh Namāh* or Book of Kings, upon which he worked for 35 years. The poem traces the fortunes of Iran, even from the time of the legendary kings, including the great Jamshīd, who in the golden age reigned 500 years. The chronicle or, rather, epic closes with the fall of Persia before Islam. The poem was presented to Mahmud of Ghazni, but so petty was his reward that Firdausi wrote a bitter satire upon the monarch, and fled the country. A work of his old age is a poem upon Joseph and Potiphar's wife, as told in the *Koran.*

Fire-Damp is the miner's term applied to coal-gas when it issues from crevices in coal mines. The issue of the gas can sometimes be heard, and it can be lighted. When it has from a quarter to a sixteenth part of air, it will explode, producing disasters that are too well-known in the history of mines. The explosion stirs up the coal-dust, and as each particle is fired the result is like the firing of grains of gunpowder.

Fire-Engine, a machine for the purpose of throwing water to extinguish fires. Machines for this purpose were employed by the Romans, as Pliny speaks of them, and so does Hero of Alexandria. There are accounts of instruments for fires being used in Augsburg in 1581 and in Nuremberg in 1657. By 1730 Newsham, in London, had made successful fire-engines; the first used in the United States (in 1731) were of his make. The simplest engine consists of a force-pump and a cistern for water. In the larger engines there is no cistern; the suction-pipe is carried directly to the water-supply. The first fire-engine in which steam was used was that of Braithwaite in 1829; Ericsson made a similar one in New York in 1840. The heaviest American engine, with water in the boiler and men on the engine, weighs over five tons. Chemical fire-engines are used to extinguish fires in small spaces; they depend on the rapid production of carbonic-acid gas, which is an enemy to all kinds of combustion. See Roper's *Handbook of Modern Steam Fire-Engines.*

Fire-Extinguisher, a term generally applied to a number of chemical agents, which extinguish fires by forming carbonic-acid gas. Fire-extinguishers are so made that they may be carried on the back and their stream directed by the hand.

Fire'fly, an insect capable of emitting light from some part of its body. These insects light marshes and wet meadows, the banks of streams and ponds, and frequently are very abundant. Those of tropical countries are most brilliant. In tropical America several are confined in a cage to give light. For the most part they are soft-bodied beetles of small or medium size, and fly at night. The luminous spots are yellowish in daylight. These are located on several joints of the lower side of the abdomen, and are richly provided with air-tubes. It is believed that the bright light is due to oxidation of the contents of the cells in the luminous patches. At any rate, phosphorus has nothing to do with it. In the United States they usually are called lightning-bugs. In Europe there are certain kinds in which the female is without wings, and has luminous patches on the abdomen. These and larvæ that are luminous are called glow-worms.

Fire'proofing. The word fireproofing may mean the ways of so constructing buildings, safe-deposit vaults etc. as to make them capable of resisting the action of fire, or it may mean the coating of such combustible materials as wood and textile-fabrics, making them as fireproof as possible.

The means used to make buildings fireproof is, in general, to avoid as far as possible in their construction the use of combustible material, particularly wood; stone, brick, iron and cement being largely substituted for it. Of course most so-called fireproof constructions are only relatively so. If wood is carefully coated with a solution of silicate of soda, it will usually resist a high degree of heat without undergoing serious injury. A 20% solution of tungstite of soda is much used for making linen or cotton-materials fireproof. The textile is steeped in the solution and then dried. Different kinds of solution are used, varying with the different kinds of materials to be rendered fireproof. Some of the solutions used are apt partly to destroy the fabric. Fireproofing of this nature is extensively used for the canvas-material from which the stage-scenery used in theaters is constructed. If this scenery is not made fireproof, there is danger of great disaster, as theatrical contrivances are often such as easily to start a blaze. There are some paints that are claimed to make wood fireproof. These often contain sodium silicate and zinc chloride.

Fire'works. The art of making fireworks is called pyrotechny. They are made of some explosive material, of different colors and shapes, and used usually for amusement, though the rocket has been used for a signal in war. The powder generally used in fireworks is made on the same principle as gunpowder, and (besides the powder) niter, sulphur and charcoal are the main ingredients. Iron or steel-filings brighten the fire; zinc-filings give it a fine blue color; copper-filings give it a greenish tint. Yellow is produced by amber, resin and salt, and lampblack makes the fire red. Firecrackers, torpedoes, Roman candles, rockets, wheels etc. are among the common fireworks. The present form of fireworks, of course, does not go back of the invention of gunpowder; but the Chinese, who excel in the manufacture of them, had some form of them in use from an unknown period.

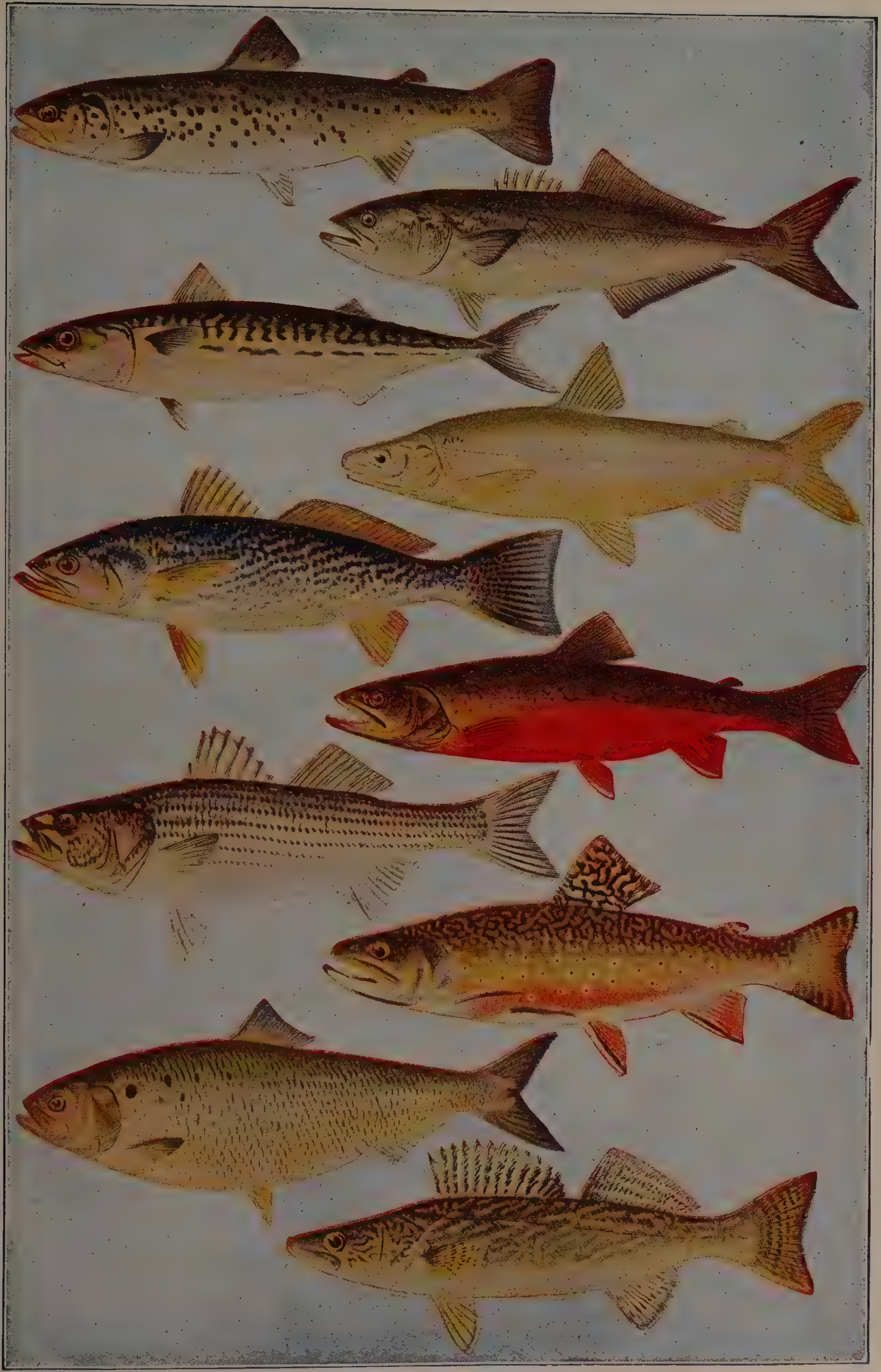
Fish-Culture. The importance of fishes as food has led to the formation of commissions by different governments for their care and spread. The culture and protection of certain kinds of fish was practiced as a private enterprise from 1750 onward, but the first public hatcheries were established in France in 1850. Soon after, in 1865, fish-hatching began in the United States, in New Hampshire, Vermont and Massachusetts. The United States now gives greater attention to the culture, propagation and spread of fishes than any other nation. A United States fish-commission was created in 1871, with Spencer F. Baird as fish commissioner. Attention was very early given to the propagation of shad, and the number of those fish greatly increased. In 1880 the rivers of Georgia were stocked with shad, and in the course of four or five years they were caught there in abundance. In 1890 the catch of shad along the Atlantic coast was two and one half times as large as in 1880. The government pays for the support of the United States fish-commission about $150,000 annually; and, in addition, more than 30 of our states support state fish-commissions.

The work of preserving and increasing our food-fishes consists in keeping the waters free from contamination by mills, sewage and other causes; in establishing laws to control the methods and seasons of fishing, in the cultivation of proper food-elements; and in the hatching and distribution of the young fish. Fish-breeding is practiced in many fish-hatcheries. The eggs are sometimes collected from the spawning-grounds; at other times fishes are obtained in a ripe condition and the eggs are pressed out by running the thumb along the under surface of the abdomen. The milt is then pressed out from the male fish and spread over the eggs. Thus they are artificially fertilized, and it is found that by this method a much higher percentage of the eggs is fertilized and developed than in the natural spawning-grounds. The eggs are now protected and reared in boxes and jars provided with running water. In some cases the young are fed by finely divided liver or other suitable food. After they reach a certain size, the young fish are shipped, and distributed in lakes, rivers and ponds. The United States government and several of the state fish-commissions have special cars, fitted with tanks, for transporting fish. The supply of fishes has been greatly increased, and new kinds introduced into various sections of the country. Fishes have also been transported across the ocean; our trout have been carried to Japan and Great Britain, and we have received salmon and trout from Europe. Shad and striped bass have been carried from the eastern to the western districts, white-fish fry have been extensively planted in the great lakes, and the range of black and striped bass and other fish has been greatly extended. The extent of the work of distributing fish is great. Some of the states (Michigan, Wisconsin, New York, Pennsylvania) have distributed from 40,000,000 to 135,000,000 of fish in a single year. The term fish-culture and the work of the United States fish-commission have broadened to take in the protection and care of the seal-fisheries, of lobsters, oysters etc. See the various publications of the United States fish-commission.

Fish, Hamilton, American diplomatist, was born at New York on Aug. 3, 1808, graduated at Columbia College, and was admitted to the bar in 1830. He was a Whig in politics, was elected a congressman in 1842, lieutenant-governor of New York in 1847 and governor in 1848. In 1851 he was returned to the United States senate, and acted with the Republican party. From 1869 to 1877 he was secretary of state under Grant, signing, as one of the commissioners, the Washington treaty of 1871, which settled the Alabama question. He died at Garrison's, N. Y. on Sept. 7, 1893.

Fish'er, George Park, an American clergyman and church-historian, was born Aug. 10, 1827, at Wrentham, Mass. He graduated from Brown University in 1847 and, after a course of study in Germany, was made professor of divinity in Yale College in 1854 and of ecclesiastical history in 1861. Among his best-known writings are *History of the Reformation*, *Beginnings of Christianity*, *Grounds of Theistic and Christian Belief* and *Nature and Method of Revelation.*

Fisher, Admiral Sir John Arbuthnot, was born in 1841, entered the British navy in 1854, and took part in the capture of Canton and the Peiho forts in 1860. He served in the Crimean, Chinese and Egyptian Wars, commanding *The Inflexible* at the bombardment of Alexandria in 1882. He has successively occupied the following posts: Director of Naval-Ordnance (1886–91); Admiral-Superintendent of Portsmouth dockyard (1891); Lord of the Admiralty (1892–7); Commander-in-Chief on the North American and West Indies station (1897–9); delegate to the Hague peace-conference (1899); Commander-in-Chief on the Mediterranean station (1899-1902); second Sea-Lord of the Admiralty (1902–3); and Commander-in-Chief (1903–4) He now is first Lord of the Admiralty.



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GROUP OF FISHES

Land-locked Salmon. Common Mackerel. Weak-fish. Striped Bass. Shad. Bluefish. White-fish. Canada Red Trout. Brook Trout. Wall-eyed Pike.

Fishes, aquatic vertebrates, breathing by gills. They are very numerous, and are of interest to the sportsman as game, to people in general as food and to the scientific student. Excluding the lancet and the *Cyclostomata* as below the true fishes, there are four orders left. 1. Bony or modern fishes (*Teleostei*). This is far the largest group, including most of the food and game fishes both in fresh and salt water, as cod, bass, perch, pike, trout, mackerel, etc. 2. Ganoid or ancient armored fishes (*Ganoidei*), including fishes with shiny hard scales, like the garpike, sturgeon, bowfin, etc. Representatives of this order are found as fossils in very ancient rocks, while the first order occurs as fossils only in relatively modern rocks. 3. Mudfishes, or double breathers (*Dipnoi*), including fishes that possess both gills and lungs, being the lowest vertebrates to have lungs. These first lungs are formed from the air-bladder, which is interesting, as it gives us a clue to the origin of lungs. These fishes live in the waters of Africa and Australia that dry up, and they form for themselves mud cases in which they live till the water returns again. The heart is imperfectly three-chambered, and by this and the possession of lungs they are closely allied to the *Amphibia.* 4. Cartilaginous fishes (*Elasmobranchii*), fishes with a cartilaginous skeleton and brain-case, instead of a bony one, including sharks, rays, skates, torpedoes, etc.

Fishes make a natural group or class. They have a two-chambered heart, consisting of an auricle and ventricle. They have gills and blood vessels running in the gill-arches that are called aortic arches—usually four or five in number. These run around the pharynx and unite above into the aorta or great artery. The blood is sent out from the heart to the gills; there it takes in oxygen and continues its circulation as arterial blood; and, passing through the capillaries of the body, it returns to the heart as venous blood. Fish have fins, supported by fin-rays, for swimming. Their colors vary, and often are brighter during the spawning season. Their food is diverse, many of them eating smaller fishes, crustacea and worms, while others feed upon plants; some few swallow mud for the sake of the organic matter contained in it. Their eggs are usually laid in immense numbers; for example, the whitefish or trout lays about 50,000 eggs in one season. Some forms, like sharks, lay few eggs, which are either retained within the body till hatched, or, in closely related species, are laid in the water, enveloped in a horny case. The horny cases of skates and sharks are called mermaid-purses. Some forms, like sticklebacks, build nests and care for the eggs until hatched. All fishes possess a set of sense-organs that are fitted to receive vibrations from the water, called the sense-organs of the lateral line. If any common fish be examined, there will be seen a line running on each side about the middle of the body. This is the position of the lateral line. These organs exist also in the tadpole stages of frogs and toads, but disappear when the animals leave the water, and are not present in land animals. Deep-sea explorations have brought to light many strange and curious fishes, some of them having luminous spots, from which light is emitted. See BLINDFISH, CARP, COD, GOLDFISH and others in alphabetical order. See Goode's *American Fishes;* Baskett's *The Story of the Fishes;* and Jordon's *Fishes* (1907).

Fishhawk or **Osprey,** a common well-known bird of eagle-like appearance, found in all countries, except Iceland and New Zealand. It is abundant in the United States along the Atlantic, and is also found inland in the vicinity of water. The American osprey is about two feet long; brownish above and whitish below; the upper part of the beak is strongly curved over the lower, and the claws are long and sharp, being especially formed for grasping. These birds feed exclusively on fish, and are expert fishers. They fly to and fro above the water and make a sudden dash after fish near the surface, sometimes going into the water to a depth of about one and one half feet. Their feathers are compact and oily, and do not become wet. The bald-headed eagle often chases the osprey, and robs it of its fish while in the air. In America the osprey nests on large trees, in Europe on rocky cliffs. The great nest is built of sticks, sea-weed and other material, and is used year after year. The two to four eggs vary in color, sometimes being white, again buff or chocolate. Ospreys mate for life, show much family affection, often make of the nest an all-year-home.

Fiske, John, an American author and historian, was born March 30, 1842, at Hartford, Conn. Graduating from Harvard in 1863, he became known as a deep thinker and forcible writer. In 1861 he made his mark with a notable critique on the fallacies in Buckle's history of English civilization. From 1869 to 1879 he was at Harvard, first as a brilliant lecturer on philosophy, then as assistant-libra-

JOHN FISKE

rian. The earlier recognition of him was chiefly of the expounder of evolutionary philosophy, and his lucidity in popularizing Spencer was admired by Darwin. After 1879 he devoted himself chiefly to American history, though his *Idea of God* (1885), *Origin of Evil* and *Through Nature to God* gave his last answers to questions in philosophy and religion. His histories extend from the earliest discoveries to the beginnings of Federal government; cover almost every phase of American life; and have dramatic interest as well as great historical value. As a lecturer and writer on philosophy and history, he took high rank among American authors, while he did much to elucidate and popularize the doctrine of evolution. Among his works are *The Destiny of Man; Outlines of Cosmic Philosophy; American Political Ideas; The Discovery of America; The Beginnings of New England; Civil Government in the United States; The American Revolution; Old Virginia and Her Neighbors;* and *The Dutch and Quaker Colonies in America.* He died at Gloucester, Mass., July 4, 1901.

Fiske, Minnie Maddern, born in New Orleans in 1865, is a well-known American actress of the realistic school. Like many other successful actresses, she spent even her childhood upon the stage. In 1890 she married Harrison Fiske. Some of her greatest successes have been made in *Becky Sharp*, in Ibsen's *A Doll's House* and in Hardy's *Tess of the D'Urbervilles.*

Fitch, John, inventor, was born in what is now South Windsor, Conn., in 1743, and is said to have committed suicide in the summer of 1798. In 1785 he completed his first model of a steamboat, which had wheels at the sides, replacing them in the following year with paddles. In the face of discouragement he built a vessel 45 feet long, which made a successful trial trip on the Delaware at Philadelphia, Aug. 22, 1787. A larger one was built in 1790, and attained a speed of eight miles an hour. Robert Fulton's steamboat was, in 1817, declared by a committee of the New York legislature to be "in substance the invention patented by John Fitch in 1791."

Fitch'burg, Mass., a city in Worcester County, Massachusetts, on Nookagee River. The city has grown a good deal during the last ten years. It has a well-equipped fire-department with over 75 telegraphic fire-alarm stations. In 1900 it had about a score of churches and some 30 school-buildings, the latter valued at over $300,000. There also is a public-library and art-gallery building costing $90,000, given to the city by one of its public-spirited citizens, and $450,000 have been donated by another for a public hospital. The library contains close upon 30,000 volumes. There are many manufactories, the chief being paper-mills, machine-shops, iron-foundries, pianoforte, saw-factories, cotton, woolen and flour-mills, shoe and shirt-factories and bicycle, electrical apparatus and wood-turning establishments. Population 37,826.

Fitchett, Rev. William Henry, was educated at Melbourne University, has been president of the general conference of the Methodist church of Australasia, is principal of the Methodist Ladies' College at Melbourne, was former editor of the Melbourne *Daily Telegraph*, and is now in charge of the editorial interests of *The Southern Cross* and *Life.* He is even better known for his stirring recitals of British fighting on land and sea, his published works including *Deeds that Won the Empire, Fights for the Flag, How England Saved Europe, Wellington's Men, Nelson and His Captains* and *The Commander of the Hirondelle.* These works are circulated and read throughout the English-speaking world.

Fitzpatrick, Hon. Sir Charles, was born in the city of Quebec in 1853, and educated at Laval University. For six years (1890–6) a member of the Quebec Legislature, he was elected to the House of Commons in 1896. He was solicitor-general and, afterwards, minister of justice in the Laurier administration. He became chief-justice of the supreme court in 1906.

Five Forks is a place in Dinwiddie County, Virginia, known to history as the site of a battle fought between the Union forces under Gen. Phil. Sheridan and the Confederate army under General Lee, on April 1, 1865. General Sheridan won the battle, the result of which was the evacuation of Petersburg on April 2, Richmond falling shortly afterward.

Flag, a strip of some light cloth attached at one end to a staff, used as a local or corporate emblem by a nation or city for military and naval purposes; to express rejoicing, mourning and the like; or to make known some fact to spectators. Flags are supposed to have had their origin in the fixed standard of the Romans. One of the earliest known flags was the gonfalon, borne near the person of the commander-in-chief in battle. Besides this, there were three kinds used in the middle ages: the pennon, used by a knight who had followers to defend it; the banner, borne by a king, prince, duke or other noble, with the owner's coat of arms covering its entire surface; and the standard, used among persons of distinction in the 14th, 15th and 16th centuries. In most countries, except republics, the sovereign has his own flag. The stars-and-stripes of the United States was adopted by Congress on June 14, 1777, nearly a year after the Declaration of Independence, and consisted of 13 stripes alternately red and white and a device of 13 white stars on a blue ground in the upper corner nearest the staff; the number

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FIRST FLIGHT OF "OLD GLORY"

The Flag of the "Stars and Stripes" adopted by Congress June 14, 1777, was first displayed at Ft. Staniwix (now Rome, N. Y)., August 2, 1777.

of stripes and stars agreeing with the number of states. There are many theories of the origin of our flag, but none is satisfactory. Washington's arms contain the stars and stripes, but they are neither blue, red nor white. It will never be known who designed the union of stars. It is claimed that in 1776 Mrs. John Ross of Philadelphia, at the suggestion of Washington and George Ross, made and partially designed the first national flag combining stars and stripes. It was first displayed at Fort Stanwix, now Rome, N. Y., on Aug. 2, 1777, and Paul Jones asserted that he was the first to display it at sea, but it was slow to get into general use. In 1818 it was enacted that the stripes should continue to be 13, that the stars should be 20 in number, there being then 20 states, and that a star should be added for every new state coming into the Union. In 1907 the number of stars had increased to 46. The flag of Great Britain has the insignia of England, Scotland and Ireland on a quartered field, two quarters red, one yellow and one blue. The naval flag, called the Union Jack, has a blue ground, crossed by the crosses of Saints George, Andrew and Patrick. The French flag, called the tricolor, has three broad, perpendicular stripes of blue, white and red. The German imperial standard is yellow, divided by the iron cross into quarters, on each of which are three black eagles and the crown, with the imperial arms on a gold shield in the center. The German merchant-flag is of red, black and white in horizontal stripes. The Russian flag is yellow, with the Russian arms. The flag of Denmark probably is the oldest in existence, dating from the 13th century, and is red, with a white cross. The flag of Turkey is red, with a white crescent moon and eight-pointed star. By the consent of all nations a flag of truce is white; striking the flag denotes surrender and placing the flag of one country over that of another indicates victory; flags at half-mast mean mourning; the red flag mutiny; the black flag a pirate; and the yellow flag quarantine.

Flag-of-Truce. A white flag raised by one party in time of war to indicate to the opposing party their desire to communicate with them, as, for example, concerning terms of settlement or capitulation. There are certain rules in connection with the use of the flag-of-truce, the observance of which has come to be considered by nations as morally obligatory. While it is not at all necessary that hostilities should be suspended, or firing stopped, upon the erection of a flag-of-truce, the deliberate shooting of the bearer of a flag-of-truce is considered to be a very disgraceful and unjustifiable act. On the other hand, to use a flag-of-truce as a means for spying upon the resources of the enemy or other such illegitimate purpose, is considered especially dishonorable. The bearer of a flag of truce may be held by the enemy, if deemed advisable. Flag-of-truce proceedings, to be regular, must be conducted by the senior officers of the respective forces. In naval engagements the vessel bearing the flag-of-truce is usually kept off by the recipients at a safe distance, unless her harmless character is clearly apparent, in order to avoid the possibility of treacherous use of torpedo-boats, etc.

Flamin'go, a bird with very long legs, a long neck and very singular bill. Formerly the flamingo was classed as a wading bird, but now it is frequently united with the ducks, or placed in a group by itself between ducks and geese, and herons and storks. It is the long legs and neck that made the true relationships obscure. The lower part of the bill forms a deep, broad box, into which the upper part fits like a cover, and the whole is bent abruptly downward in the middle. The margins are provided with ridges arranged crosswise as in the duck's bill. Much mud is taken with the food (small crustacea, mollusks, vegetables), and is afterward strained out between the furrows on the bill. There are about eight species living (they were more numerous in geological times) in tropical and subtropical countries. Only one species is found in the United States, in the marshes of Florida and Louisiana. It is rose-colored and deep red; the young are white. In zoological gardens flamingoes lose their bright colors. The nests are of mud, from a few inches to a foot and a half high, and the birds sit with legs folded under the body, not, as was formerly supposed, astride the nest.

FLAMINGO

Flammarion (*flȧ'mȧ'rē'ôn'*), **Camille,** French astronomer, was born at Montigny-le-Roi (Haute Marne), on Feb. 25, 1842 and educated at Langres and under Leverrier in Paris. In 1862 he founded a monthly review dealing with astronomical matters, and has written extensively on the heavenly bodies, founded astronomical societies and observatories, etc. Among his more notable works, many of which are to be found in English translations, are *The Plurality of Inhabited Worlds*, *God in Nature*, *The Atmosphere*, *The Stars and the Curiosities of the Heavens*, *Urania*, etc. M. Flammarion takes a lively interest in the planet Mars, and has made many balloon-ascents to study the condition of the atmosphere at great altitudes.

CAMILLE FLAMMARION

Flan'ders, the country of the Flemings, lying on the North Sea, embraced the present Belgian provinces of East and West Flanders, the southern portion of Zealand in Holland and the greater part of ancient Artois in France. It was originally inhabited by Belgic tribes, on whose subjection by one of Cæsar's lieutenants it was added to Roman Gaul. It was afterwards overrun by Franks, and, by the treaty of Verdun, Flanders was added to Neustria. The first government of the country was presided over by a count, Baldwin I, appointed by the king of France in 837. The town of Valenciennes was added in 1006, as were also Ghent and the Zealand Islands. Under Baldwin V the counties of Alost, Tournai and Hainault were added. On his death the Netherlands portion was set aside for Baldwin's younger son, who, on the death of his elder brother, wrested Flanders from the widow, leaving to her and her son Hainault only. From this time to the end of the 12th century the Flemish territories remained thus divided. In the 10th and 11th centuries Flanders rose to be the chief center of wool-weaving in Europe. In 1256 the Zealand Islands were given to the count of Holland, and they still remain in Holland's possession. From 1302 to 1320 the Flemings struggled successfully with France. In 1529 France resigned her claims to Flanders, and with the accession of Philip II to the throne of Spain the history of Flanders becomes identical with that of the Spanish Netherlands. The treaty of Westphalia transferred Dutch Flanders to the United Netherlands, whilst by the treaties of the Pyrenees in 1659, Nimeguen in 1678 and Utrecht in 1713 Louis XIV succeeded in adding to France Artois and a large part of French Flanders. By this last treaty and that of Rastadt, in 1714, the remainder of Flanders was assigned to Austria, and is known as the Austrian Netherlands. On the formation of the new kingdom of Belgium, in 1831, the provinces of East and West Flanders were united with it. The area of these provinces is 2,408 square miles, with a population of 2,004,784. West Flanders abuts on the North Sea, and has a fertile soil, good for growing flax and cotton, and is also noted for its cattle and leather-trade. The people of both provinces are chiefly Roman Catholics and of Flemish stock. Ghent (pop. 164,659) is the capital of East Flanders; while Bruges (pop. 53,995) is the chief town of West Flanders, with its seaport of Ostend (pop. 41,698). The active industries of West Flanders include fishing, lace-making and spinning and weaving linen, together with the growing of flax, hops and tobacco. In East Flanders the industries are much the same, in addition to cattleraising and the manufacture of cloth and paper. The two principal rivers are the Scheldt and the Lys.

Flandrin (*flän'drän'*), **Jean Hippolyte,** an historical and portrait painter, was born at Lyons, France, May 23, 1809. Between 1842 and 1845 he decorated many churches in France, and was ranked as the greatest religious painter of the century. His great frescoes, *Christ Entering Jerusalem* and *Christ Going up to Calvary*, in the church of St. Germain, at Paris, and his picture of *St. Clair Healing the Blind*, in the cathedral of Nantes, are among his best-known works. He died at Rome, March 21, 1864.

Flat'fish, the name given to a number of salt-water fishes, flattened from side to side like the flounder, halibut, plaice, sole and turbot. Some fishes are flattened from above, like skates, torpedoes, etc., but these are not called flatfishes. The true flatfishes have lost their symmetry, both eyes come to occupy one side, and the mouth is twisted. They lie on the bottom with the blind side downward, and, in swimming, progress through the water with this side underneath. The upper side is colored, but the under side is whitish. When these fish are first hatched, both sides are alike and the eyes are symmetrically placed right and left. Soon they begin to become flattened, and the eye of one side travels gradually over the crown of the head and becomes placed close to the other eye. The mouth also becomes twisted. In the meantime the fish turns on one side, and, in swimming or resting, keeps the blind side downward. The colors also disappear from this side. Recent experiments tend to show that if the blind side is kept illuminated by light reflected from a mirror, the white side will remain colored or develop its color again.

Flat'heads, a term applied to the Selish Indians, a small tribe dwelling on Clark's

Fork, in Idaho. The men are industrious and have become good farmers, and, although brave and good warriors, have never fought against the whites. Their name refers to the ancient practice of flattening the skulls of young infants in various ways, as was done in Peru before and after the arrival of the Incas, among the Caribs in Central America, Mexico and Florida and among the mound-builders of the Ohio and Mississippi valleys. Among modern Indians the practice is mostly confined to the Chinooks and other tribes of the northwestern coast of North America.

Flax. Species of the genus *Linum*, and especially the cultivated flax, *L. usitatissimum.* The genus contains about 80 species, belonging to the temperate regions both of the northern and southern hemispheres. The flowers are bright and showy and remarkably regular. The common flax has been cultivated from ancient times, and is unknown in its original wild state. It is cultivated not merely for its valuable fiber but for linseed or flaxseed oil. The fibre is used for the coarsest as well as the finest fabrics, and is not only valued for finest linen cloth and filmy lace but is employed in the body of cordage and rope. It was raised in Egypt in the days of the Pharaohs; has been famous for ages; and is still grown there in large quantities. Of the European countries where it is extensively cultivated Russia, Belgium and Ireland stand to the fore. Cultivation of it was begun in America by the early settlers, and some impetus given when the supply of cotton was cut off by the Civil War. Of late flax-culture for fibre has been receiving increasing attention. It will grow in almost all parts of the United States, but requires a great deal of care and labor. The flaxseed production of the United States in 1906 was 25,576,146, bushels.

FLAX

Flea, a small, wingless insect with a sharp pointed beak, by means of which it punctures the skin of animals upon which it lives, leaving a red, itching blotch. These insects have powerful legs, and are remarkable jumpers. Fleas live on the dog, cat, rabbit, pigeon and poultry. The fleas of the dog and the cat will also attack man, but there is another species of fleas known as the human flea. To rid a dog or cat of fleas, the animal should be dusted with Persian insect powder, and the sleeping-places thoroughly cleaned. The human flea is not very abundant in the United States, except in warm, sandy districts, but they are common in Europe. In northern Africa and in some eastern countries they are a terrible torment. A single flea will inflict many bites. As a protection, the tops of the stockings should be dusted with insect-powder, and it may also be sprinkled between the sheets at night.

Fleur-de-Lis, a symbol in heraldry, meaning literally flower of the lily, is famous as the emblem of the kings of France in the middle ages. The full device was three lilies on a blue field or ground. The origin of the fleur-de-lis in nature appears to have been, not the lily proper, but the iris-plant. Its conventional form has been traced back to the ancient Etruscans.

Flicker, a bird with many names, a member of the woodpecker family. It is known as Yellow-Hammer, High-Hole, Golden-Winged Woodpecker, etc. It is a large bird, considerably larger than the robin. When flying, it displays a shimmer of yellow and a flash of white; the wing-shafts and lining and tail-quills are a rich yellow, the tail white on the upper side. Above, it is a grayish brown barred with black, wings black and yellow, a noticeable patch of white low on the back, the head gray. It wears a noticeable top-collar of a beautiful shade of red; the light color underneath is thickly dotted with black, with a black crescent on the upper part of the breast. He is a handsome fellow and yet, on the ground, not conspicuous, his protective coloring being that of the ground, where he frequently feeds. Ants are his chief food. Though a woodpecker, he leaves most of the boring to other members of the family, and gets his ants from the ground or from decayed wood. He is not above using another woodpecker's deserted nest, but often bores nests in apple trees and decayed stumps; sometimes the nest is found 60 feet up from the ground. Six white eggs are the rule. The breeding-range is throughout the eastern states.

Flint, a mineral, a variety of quartz, consisting almost entirely of silica, with a little lime, oxide of iron, water and, sometimes, carbon. It varies in color from almost black to light brown, red, yellow and grayish white, and is sometimes mottled or spotted. Flint is often found imbedded in chalk, and is also found in beds or veins. It was used to strike fire with steel and in firearms. The most ancient use of it was for sharp weapons and cutting instruments. It was also used by American Indians for arrowheads.

Flint, Austin, American physiologist and writer, was born at Northampton, Mass., on March 28, 1836, and graduated in 1857 from Jefferson Medical College, Philadelphia. In 1859 he removed to New York, and, after filling the chair of physiology in a school of medicine in New Orleans, became professor of physiology and microscopic anatomy in the Bellevue Hospital medical college and lecturer in the Long Island college-hospital. In 1874 he was appointed surgeon-general of New York state. He is the author of a number of important medical treatises, among which are a *Text-book of Human Physiology; The Source of Muscular Power;* and *Physiology of Man.*

Flint-Implements of the primitive people of prehistoric times are commonly found on the graves or on the sites of settlements of the earlier inhabitants of almost every country in Europe. They consist of spear-heads, arrowheads, daggers, knives, saws, borers, scrapers, chisels and axes. No modern savages or barbarous tribes have produced anything so finely finished as the weapons and implements of the prehistoric peoples. Some of them, as the knife-blades and dagger-blades of Denmark and Sweden, are marvels of workmanship. Flint is the only kind of stone capable of being worked into a variety of shapes by flaking and chipping. See *Ancient Stone Implements* by Evans.

Flint, Mich., the capital of Genesee County, in southeastern Michigan, is situated on Flint River, 60 miles northwest of Detroit, and is served by the Chicago and Grand Trunk and Flint and Pére Marquette railroads. Flint is known as the vehicle-city, because of its extensive factories. The Buick Motor Co. at completion will be the largest in the world. It is the seat of the state Institution for the Deaf and Dumb and of Oak-Grove Home, a private establishment for the care of the feeble-minded. Population 38,550.

Flodden, Battle of, fought on Flodden Hill on the Scottish borders, between James IV of Scotland and an English army under the Earl of Surrey, Sept. 9, 1513, was the most grievous defeat that Scotland ever suffered. King James had 30,000 men, and the Earl of Surrey 32,000; the former lost from 5,000 to 12,000 men, including the archbishop of St. Andrews and 12 earls, and the latter 4,000 men. The sixth canto of Sir Walter Scott's *Marmion* contains a splendid and fairly accurate description of the battle. See Robert White's *The Battle of Flodden* and Scott's *Marmion.*

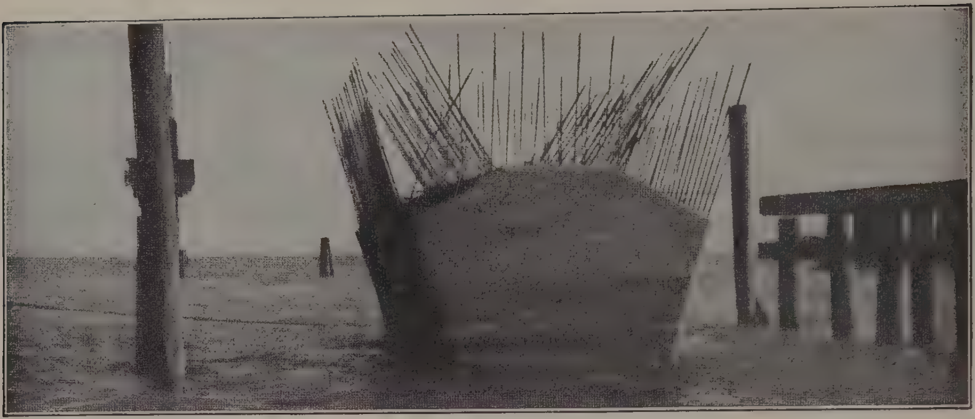
Flood-Plains are level tracts of land which have been formed by the sediment deposited by a river when in flood. The flood-plains of the Nile, the Mississippi, the Po and other rivers are of great extent and very fertile. Frequently the course of a river changes by a gradual swing to one side, owing to the settling of sediment in its own channel, and in this way a *delta* of flood-plains is apt to be formed, as in the case of the Nile and the Mississippi, at its mouth.

Flora, an ancient Italian deity, the Roman goddess of flowers. At Rome she had two temples. She was represented as a flower-crowned maiden, in the full bloom of maidenly beauty. On the occasion of her festival, held at the end of April, the dwellings were decked with flowers, and feasting, dancing and singing prevailed everywhere.

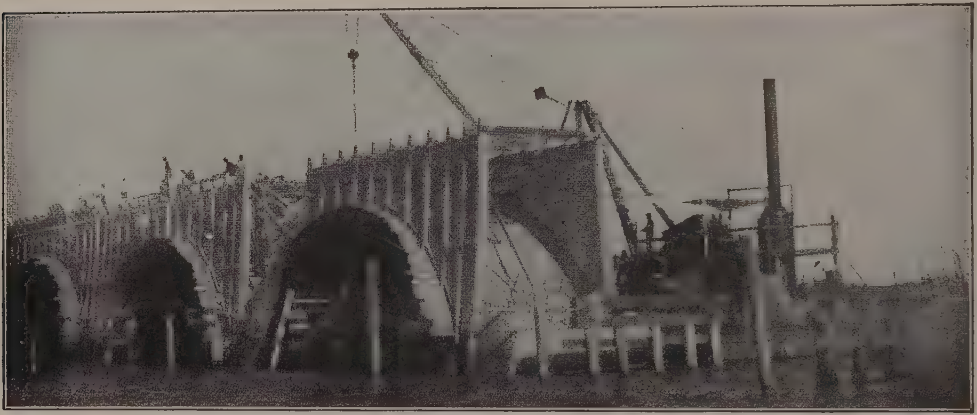
Flor'ence, a city of Italy and capital of the province of Florence (Firenze), is situated in the valley of the Arno. The province of Firenze has an area of 2,265 square miles, with a population of 995,048. The establishment here in 1864 and 1865 of the seat of the Italian government was the means of increasing the city to nearly double its former extent. The chief building in the city is the cathedral, the foundations of which were laid in 1298; while in 1887 the finished building was uncovered with great pomp in the presence of the Italian sovereigns. The dome served Michael Angelo as a model for St. Peter's. The church contains sculptures by Michael Angelo and other famous artists. There are many other handsome churches in Florence, containing a wealth of paintings and sculpture. Among the famous palaces are Il Bargello, Vecchio, Signoria, Uffizi, Pitti, Riccardi and Strozzi. The Pitti palace contains the national library, with 200,000 volumes and 10,000 manuscripts, and the famous Florentine gallery of art, filling 23 rooms. The city of Florence sprang originally from Fiesole, at the foot of which it lies extended. In the 11th century it was bequeathed to Pope Gregory VII, and, under the protection of Rome, became a city of importance. By 1250 it had become one of the first cities of Italy and held its place for many years. In 1348 the black death carried off 100,000 of the city's inhabitants. In 1529 the city was besieged by an army under the duke of Orange and fell Aug. 8, 1530. After the constitution of the united kingdom of Italy, Florence held the position of provisional capital from 1864 to 1871. Its population is about 227,000. In art Florence holds a unique place, the Florentine school being the most important in Italy. In literature its position is hardly less important, as is attested by the names of Dante and Boccaccio. See Mrs. Oliphant's *The Makers of Florence;* Ruskin's *Mornings in Florence;* George Eliot's *Romola.*

Flor'ida, meaning the land of flowers, is the most southern portion of the United States. It is a peninsula, bordered by the Atlantic Ocean and the Gulf of Mexico. It covers an area of 58,680 square miles of which 4,400 square miles are water, and is about 450 miles long and 100 broad.

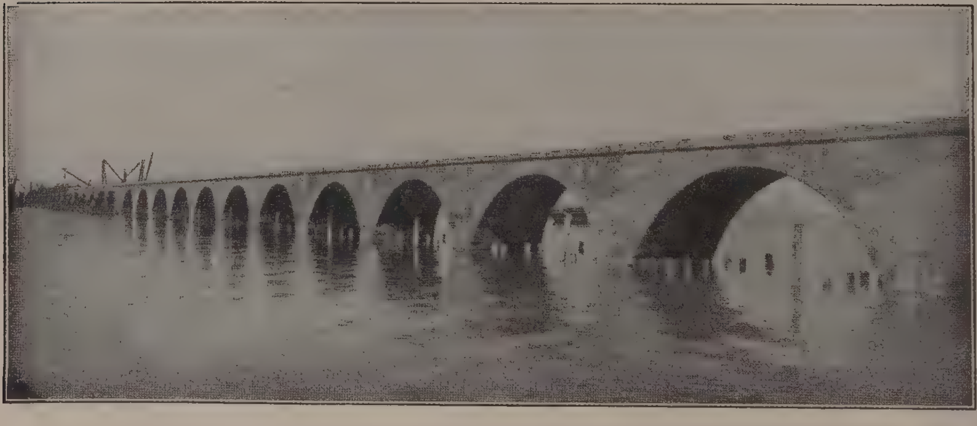
Surface and Drainage. It is for the



BUILDING PIER OF CONCRETE WITH STEEL REËNFORCEMENT



BUILDING CONCRETE ARCHES, SHOWING FRAMEWORK



SECTION OF FLORIDA KEYS RAILROAD, BUILT ACROSS OPEN SEA most part a swampy region; its lakes, which number about 1,200, and marshes and swamps covering about a fifteenth of the state. The Everglades are an example of these swamps. The Okeechobee is the largest lake. As a peninsula, it has a very long coast-line, of about 1,150 miles, with harbors at Fernandina, St. Augustine, Key West, Cedar Keys, Tampa and Pensacola Bay; it also has innumerable islands. There are 19 navigable rivers, the longest being the St. John's. This river is about 300 miles in length, one third of which can be navigated.

Climate. The climate is very healthful, and not intensely hot, being moderated by the sea breezes. There are 250 clear days in the year.

Natural Resources. With its extensive coast-line, Florida has a large fish-trade, the chief seat of which (in fresh fish) is Pensacola. About 8,000 men are employed in the fisheries. Alligator-hides are obtained here, besides sponge and coral. Of minerals, the most important is phosphate-rock, the value of this product amounting yearly to over $4,250,000. Mineral waters, lime and fullers' earth also are among its exports. There are said to be 25,000,000 acres of forest-land, upon which is found a very great variety of trees. Among these are hickory, live oak, long-leaved pine, pitch-pine, cypress, the wild orange, Indian almond, mahogany, satin-wood etc.

Products. The products are lemons, oranges, pineapples, figs, bananas, cocoanuts and other tropical fruits, with coffee, rice, cotton, tobacco, sea-island cotton, sweet and irish potatoes, melons, sugar-cane, peanuts and cassava, besides corn and other cereals for local use. Its most important crops, however, are oranges and pineapples.

Industries and Manufactures. Market-gardening and fruit-raising for the northern markets are among the principal industries, which also include the preparation of pine and live-oak timber used in shipbuilding, cigar-making, the production of turpentine, tar, resin and pitch, cotton-seed oil and sponge and coral fisheries. The manufactures of the state amounted in value to over $72,000,000 in 1909. These, besides the forest-products include fertilizers, cotton-seed oil, wooden boxes and barrels and cedar for lead-pencils; but the leading industry is the manufacture of tobacco and cigars. In 1910 the assessed valuation of property in the state exceeded $177,000,000.

Education. There are numerous colleges and public schools, including the University of Florida, at Gainesville, State College for Women and Agricultural College for Negroes, at Tallahassee, all having normal departments, and School for the Deaf and Blind, at St. Augustine. There are also private and denominational schools, among them being Rollins College and the John B. Stetson University, the latter affiliated with Chicago University. The public schools have a teaching staff of 4,500 and about 155,000 pupils.

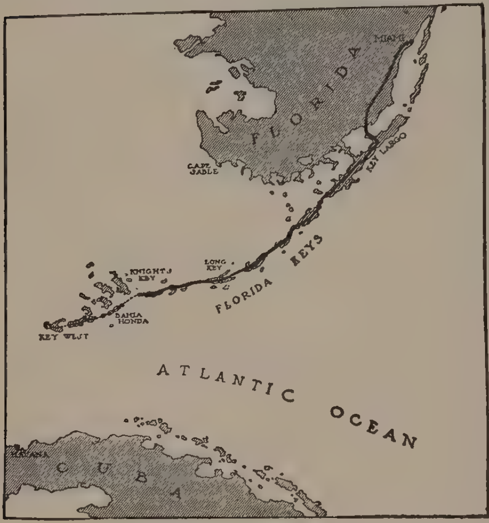
Cities. The state has developed rapidly within the last few years, and has become a popular winter-resort. Tallahassee is the capital, and Jacksonville, St. Augustine, Key West, Tampa and Pensacola are prominent cities. The revenue and disbursements about balance at $1,500,000 each, annually. Besides saving-banks, Florida has a number of state banks, with resources (exclusive of national banks) aggregating $15,000,000. In May, 1901, Jacksonville suffered severely from a conflagration, which destroyed nearly $15,000,000 worth of property.

History. Florida was discovered in 1512 by Ponce de Leon, when searching for the fountain of youth, and named by him the land of flowers. It was explored by De Soto in 1539, and in 1562 a colony of Huguenots settled there, who were massacred by the Spaniards. The first permanent settlement was made at St. Augustine, which is almost the oldest city in the United States, by Spaniards, who kept possession of the territory until 1763, when it was ceded to England in exchange for Cuba. From 1781 until 1819 Spain held the country again. Florida was ceded to the United States in 1819, organized as a territory in 1822, and admitted into the Union in 1845. From 1835 to 1842 it suffered from the struggle with the Seminole Indians, which ended with the removal of the tribe to Indian Territory. The state seceded in 1861, and was readmitted in 1868. Population 752,619. See *The Florida of To-day* by J. W. Davidson.

Florida Keys are a group or chain of small islands stretching south from the southern coast of the Florida peninsula. There are thousands of them, many of them of coral formation and most of them submerged by high tide. The longest of them is Key Largo, and the southernmost of any importance is Key West: Here is the city of Key West, the site of a naval station, with a population of 21,174, and a place of considerable commercial importance. It has lines of steamers connecting with the chief cities of the Atlantic coast. Its chief industry is the manufacture of cigars, and it also has a large trade in fish, fruit, tobacco, vegetables and sponges.

A vast and unique enterprise, the greatest engineering feat of recent years, is the railroad, which has been constructed from the mainland to Key West, a distance of 130 miles, bridging long stretches of open sea, with an equal distance built up on submerged swamps and shallows. The open water is bridged by miles of concrete viaducts, the shallows built up with solid embankments of rock, and all made to withstand the assaults of the sea, driven by tropical storms.

This undertaking was the work of the late Henry M. Flagler, who had previously built a road along the Atlantic seaboard from Jacksonville to Miami, with its series of magnificent hotels. His ultimate plan was to connect Key West with Havana by ferries which would carry solid trains, thus extending rail passenger and freight passage from New York into the island of Cuba.



Flotow (*flō'tō*), **Friedrich, Freiherr von,** a German composer, was born at Teutendorf in Mecklenburg, Germany, on April 26, 1812. He is chiefly celebrated for his operas *Martha* and *Stradella*, pleasing compositions of light and lively music. He died at Darmstadt on Jan. 23, 1883.

Flounder, a salt-water fish belonging to the group of flatfishes, with both eyes placed on one side of the body, which is kept uppermost in swimming or resting on the bottom. It is a good food-fish. See FLATFISH.

Flour is the powdered grain of wheat and other cereals separated from the outer husks or coverings — usually the powdered grain of wheat. Flour is far the most important part of man's food, rice being the only other cereal which rivals it in the number of human beings it feeds. Every indication points to the fact that the cultivation of wheat and other grains was one of the earliest developments of civilized man. From the remains found on the sites of ancient dwellings it looks as if grain was crushed in a hewn-out stone, and probably was no finer than the meal of the present day. A mortar and pestle were used among the ancient Romans for grinding grain, and during that period mills were introduced; a pair of millstones were found at Adel in Yorkshire, England, at the beginning of the 18th century. In England and Scotland it has not been definitely determined when water-mills were introduced, but it is known that in 560 hand-mills were in use. They were called querns, and consisted of two stones about a foot and a half in diameter, the lower one being a little convex, into which the upper one, being concave, fitted. At the present time flour-milling may be divided into four separate systems — flat milling or grinding; high milling or granulating; roller milling or crushing; and disintegrator milling or breaking. In all there are three main features — the cleaning and preparing of the wheat, the grinding and the bolting or dressing of the product. The stones used in the flat milling are usually about four feet two inches in diameter and 12 inches thick, and many grooves are cut in them. In roller-milling a pair of horizontal rollers rotate face to face, and crush the grain as it falls between them. The crushed product in all milling consists, in a general sense, of flour, bran and middlings. Flour is an important item of export to the people of the United States. Statistics regarding the flour-output of the United States vary. In 1900 the returns from 13,188 flour-mills, in 17 of the chief milling states and territories, showed that the average annual yield was 103,500,000 barrels, the value of which was $384,200,000. The export of flour in 1906-7 was 15,584,667 barrels; its value $62,175,397. The world's greatest milling center is Minneapolis. To make a barrel of flour requires from four and a half to five and a half bushels of wheat, according to the grading of the flour.

Flower. Technically a flower is a modified shoot, that is, it consists of a stem-axis bearing leaf-bodies. Both axis and leaves are variously modified. The modifications of flowers are endless, as every group of seed-plants has its own kind of flower. Taking the average flower by way of illustration, it is found to be composed of four distinct sets of organs, all of which are leaf-bodies which stand upon a very short or even flattened axis, technically known as the torus or receptacle. The two outer sets are the floral leaves, the two inner the sporangial leaves. The outer set of floral leaves is called the calyx, the individual parts being sepals. The ordinary

FLOWER

Meadow Lily

Wild Aster

Golden Rod

Wild Rose

Violet

Orchid

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sepals are green and leaf-like, but usually small as compared with the next set. The inner set of floral leaves is the corolla, the individual parts being called petals. It is the corolla which usually gives the display of the flower, the petals becoming delicate in texture, comparatively large in size and variously colored. The outermost set of sporangial leaves is composed of the stamens. Each stamen usually consists of a stalk-like portion, called the filament, and a pollen-bearing portion, called the anther. The anther contains usually two pollen-sacs, and the sterile tissue between them is often called the connective. The pollen-sacs are sporangia, and the pollen-grains are asexual spores. It was once thought that the stamen is a male organ, but it is merely a leaf modified to produce spores; in other words, it is a sporophyll (which see). The inner set of sporangial leaves is composed of the carpels, one or more of which may occur in the flower. Several carpels may unite to form one structure, or each carpel may remain distinct from the others, or there may be but one carpel. In any event the individual structure, whether made up of several carpels united together, or of separate individual carpels, is known as the pistil. This pistil usually develops in three regions: a bulbous base known as the ovary, which contains the ovules, which after fertilization become seeds; above the ovary there usually is a slender, beak-like prolongation, known as the style; and on the style there is developed the receptive structure known as the stigma, which receives the pollen. It was once supposed that the pistil is the female organ of the plant and that it contrasts with the stamen or male organ. It is now known that the carpels are sporophylls, that is, leaves set apart to produce sporangia, in this case the sporangia being the ovules.

Not all flowers possess all of these parts. For example, one of the sets of floral leaves may be absent, when the flower is said to be apetalous; both sets of floral leaves may be absent, when the flower is called naked; the stamen-set may be lacking, when the flower is said to be pistillate; the carpels may be lacking, when the flower is said to be staminate. In case the floral leaves are present, but cannot be distinguished from one another as calyx and corolla, it is common to speak of them all together as the perianth, as in the lilies. Very frequently the members of the same set may coalesce with one another; for example, the sepals may organize together to form a cup-like or tubular calyx. The petals may organize in a similar way, the corolla appearing like a bell, a trumpet, a tube etc. When sepals are thus united, the flowers are said to be gamosepalous; when the petals are united, the flowers are said to be monopetalous or gamopetalous or, best of all, sympetalous. When the filaments of the whole set of stamens are united, the stamens are said to be monadelphous. When the carpels are united, the pistil is said to be syncarpous. The word which contrasts with sympetalous, as indicating the opposite condition, is polypetalous; and the contrasting word for syncarpous is apocarpous. Another very common modification is that in which the sepals, petals and stamens seem to arise from the top of the ovary, the latter appearing outside the flower below the other parts, as in the common honeysuckle. Such a flower is said to be epigynous, and the ovary is often described as being inferior. The term for the contrasting condition is hypogynous. Flowers are often also irregular, the members of the different sets, notably the petals, not being all alike. This results in the formation of two-lipped flowers, spurred flowers etc. This condition of irregularity is known as zygomorphy, and the contrasting term applied to a regular flower is actinomorphy. The great purpose of the flower, with more or less conspicuous floral leaves, seems to be to secure pollination by means of insects. See POLLINATION. JOHN M. COULTER.

Flowers, National. Long years of association, tradition and event give the flower of a nation its peculiar significance. It is said the shamrock holds its place in the hearts of the Irish because good St. Patrick one day, whilst preaching, used as illustration the three little leaves in cluster. Mention of England's national emblem at once brings up the Wars of the Roses at the ending of which the Tudor rose was agreed upon as the emblem of the country. Mention France's emblem, and the lily comes to mind, the *fleur-de-lis*, which not even Napoleon could make lose its hold on the people. Scotland and the thistle have long-time association; and as loyal as the Scotchman to the thistle is the Welshman to the leek. A very pretty story is that of the way the cornflower, *des Kaisers Blume*, came to be chosen as the national flower of Germany. When Napoleon's army was in possession of Berlin, Louise, mother of Emperor William I, had to take refuge just outside the city, and here comforted her crying children by wreathing for them garlands of the cornflowers that were growing all about; and so the flower was a prime favorite with William, and became favored by the nation. The national flower of the United States has not yet been agreed upon, the adoption of a national emblem being something for time and history to decide; but various states have adopted floral emblems, for instance: Kansas the sunflower; California the California poppy; Georgia the Cherokee rose; Minnesota the moccasin-flower.

Flowering Plants. A common name applied to the highest group of plants, now more commonly called seed-plants or spermatophytes, which see.

Flu'orspar'. A transparent or subtranslucent brittle mineral found either in crystalline or in massive form. Its chemical name is calcium fluoride CaF_2. Its color may be blue, brown, greenish, yellow, white and rarely red, but it commonly is yellowish or blue. It is found in England, Norway, Kentucky, Arizona, Illinois and Colorado. It is the chief source of fluorine and of hydrofluoric acid which is used for etching glass. Fluorspar is used in fusing certain minerals, in iron-smelting and also, when colorless, for the manufacture of lenses.

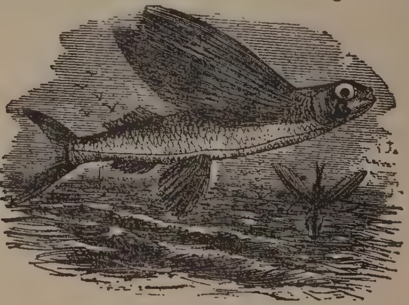
Flute, a musical wind-instrument, consisting of a tapered tube, in which the sound is produced by blowing with compressed lips into a hole near the top or wider end, which is stopped with a cork. Six holes in the lower end, closed and opened by the fingers, serve to make the musical scale. Flutes are usually made in cocoa-wood, ebonite, silver and gold. The flute is greatly used in classical music; Bach, Haydn, Handel, Mozart, Beethoven and Mendelssohn all giving it a leading part in their works. It is one of the oldest wind-instruments, having been used by the ancient Egyptians.

Flux. A flux is a substance used to make the process of melting minerals more easy. The commonest fluxes are limestone and fluorspar. A white flux is a mixture of the nitrate and carbonate of sodium or sometimes of potassium. A black flux includes carbonate of potash to remove silica and charcoal to combine with the oxygen in a metallic ore. In pottery, boracic acid, red lead and sand generally are the chief ingredients in the fluxes. A flux acts by combining with the useless matter in the ore, forming a slag in which the metal is left as free as possible, so that none may be lost in the smelting.

Fly, a two-winged insect. The word is used in compounds, as may-fly, stone-fly, butterfly etc., but when used alone is correctly applied only to two-winged insects. They belong to a natural order called *Diptera.* In the broad sense the mosquito gnat and midge are flies. The common house-fly is the best-known representative. The apple-worm is the larva of a fly. Other injurious plant-eaters are the onion-maggot and the Hessian fly. The sting of the gall-fly produces a gall on plants, in which the eggs are deposited and the larvæ reared. Bat-flies infest cattle. Flies are very prolific and breed rapidly. They are useful as scavengers, and some are agents in the cross-fertilization of plants; but they also are agents in carrying germs of disease. There are about 200 species of gad-fly or horse-fly in this country. They include the strong, large flies common on wooded roads, and smaller ones, sometimes known as deer-flies, yellowish or greenish in color, a pest, annoying to both man and beast. In summer the eggs are deposited on stems and leaves, the larvæ live in earth or water. The common house-fly is found all over the world. Contrary to popular belief it does not bite, its mouth-parts not being fitted for piercing. The stable-fly, which closely resembles it, sometimes enters houses before rain and its bite is laid to the house-fly. The eggs of the latter are generally deposited in horse-manure, occasionally in decaying vegetables. They hatch in from six to eight hours into white maggots, which under favorable conditions reach full growth in four or five days. After five days of pupa stage the adult fly comes forth. In a single summer a dozen generations may appear, and when it is taken into account that one female lays an average of 120 eggs, the great numbers of the pest are readily understood.

Fly-Catchers, name of a group of perching birds, having the following characteristics: Size, small or medium; colors, dull; head large, sometimes crested; sedentary, solitary birds, never seen in flocks; not songsters, voices more or less pleasing; in obtaining food make a sudden dash after a winged insect then return to their perch; aggressive and fearless. The fly-catchers include the king-bird, wood-pewee, phœbe, Acadian flycatcher, great crested flycatcher, least flycatcher, olivesided flycatcher, yellow-bellied flycatcher and Say's flycatcher. See Blanshan: *Bird Neighbors.*

Flying-Fish, a fish capable of projecting itself from the water and sailing through the air. There are a number of fish, mostly in the warmer seas, that possess this power. They have large pectoral fins, that are spread as a parachute to sustain the body in the air, but are not used as wings. These fishes leave the water by the vigorous use of the tail-fin. They are rather small fishes, the largest species reaching a length


FLYING-FISH

of 16 or 17 inches. Statements differ as to the distance they are able to fly. President Jordan says that the large flying-fish of southern California sometimes flies for a distance of nearly a quarter of a mile, without rising more than three or four feet. See AERONAUTICS.

Flying Squirrel, a small squirrel provided with a fold of skin on each side of the body between the limbs, which can be spread into a kind of parachute. Ordinarily the folds of skin are close against the body and do not interfere with the movements of the animal. It makes flying leaps of 30 to 50 yards between trees. When sailing through the air, the limbs are extended and the folds of skin put on a stretch. There is one species in America, with a body about six inches long and the tail of like length. Their habits are like those of other squirrels. They engage in sailing or flying mostly at twilight, and therefore are not familiar members of the squirrel family. They are not found in our desert region, but otherwise are generally distributed. The flying squirrel is our only native, tree-dwelling quadruped provided with a parachute, says Hornaday; and this author declares that it is "one of the most exquisite little animals in North America. Its legs are very delicately formed; its fur is as fine and soft as silk; and when at rest the edge of its flying membrane looks like the edge of a lace-ruffle. . . . These little creatures are quite sociable, and nest in hollow trees, where from five to seven young are born. They come out to play about sunset, and are as sportive as school boys playing tag." See Hornaday: *American Natural History* and Stone and Cram: *American Animals.*

FLYING SQUIRREL

Focus, a term employed in optics. If a luminous point be placed anywhere on the axis of a lens or mirror, there is in general a second point on this axis at which the rays leaving the first point will again meet or from which they will appear to diverge. This second point is said to be the *conjugate focus* of the first point. If, however, the luminous point be practically at infinity, as, for instance, in the case of a star, then the rays which are incident upon the mirror or lens will be parallel to each other. The focus at which the rays meet in this case is called the *principal focus.* Mirrors can evidently have but one principal focus; but lenses have two, since the parallel rays may be incident upon either face of the lens. If the reflected (or refracted) rays actually intersect at a point, that point is called a *real focus.* If, however, the reflected (or refracted) rays never meet at a point, but merely proceed as if they came from a point (*i. e.*, would meet at a point if prolonged backward), this point is called a *virtual focus.* A more satisfactory definition of focus than the preceding is the one introduced by Gauss: "that point on the axis at which, as a luminous point moves along, a discontinuity appears in the position of the image"; in other words, the position of the luminous point on the axis at which the image changes from plus infinity to minus infinity.

Fog, a cloud of very small particles of water suspended in the air near the earth. Fogs appear white because the water-particles are small and transparent. The principal source of fog is a moist soil with colder air above it. The vapor from the moist soil arises, and after the air has become saturated condensation begins and fog becomes visible Another frequent source of fog is the passage of hot moist air over cold water. The water-vapor in the air is cooled until the saturation-point is reached, after which condensation begins. Fogs of this type are seen in the early morning over rivers and small lakes. Aitkin has shown that fogs cannot form except in air in which dust-particles are present, a nucleus of some kind being required before condensation can begin.

Fogo, an electoral district of Newfoundland. Population (1901), 7,570; chief towns Orange Island (population 1,067), Queenstown, Fogo, Gander Bay and Tilton Harbor.

Folk, Joseph Wingate, governor of Missouri from 1905 to 1909, was born at Brownsville, Tennessee, in 1869. He is a graduate of Vanderbilt University. Governor Folk, as a lawyer, has been a prominent prosecutor in cases of bribery and corruption. His career as a barrister dates from 1890; and includes a period of four years during which he was circuit-attorney for St. Louis, gaining a national reputation for integrity and boldness.

Folk'lore, the study of the popular customs, traditions and tales of a people. The systematic study and collection of old ballads and tales, with the recording of customs and ceremonials, began with the 19th century, though there had been some work done in this field before, as Percy's *Reliques of Ancient English Poetry;* Scott's *Minstrelsy of the Scottish Border* (1802). The *Home Stories* of the brothers Grimm (1812); Grimm's *German Mythology; Fairy Legends and Traditions of the South of Ireland* by Croker; *Popular Rhymes of Scotland* by Robert Chambers; and *Legends of the Punjab* are examples of the work already done. The Grimm brothers, who almost created this science, spent 13 years in collecting their stories from the lips of peasants. Not only have these collections been made in all countries, but folkfore societies have been formed and several folklore journals founded. The English Folklore Society, founded in 1878, has its organ, *The Folklore Journal.* There are three folklore journals published in France, and a congress of students of the subject was held in Paris in 1889. The American Folklore Society, instituted at Cambridge, Mass., early in 1888, has for its object the collection of old English folklore, the lore of negroes in the southern states, of Indian tribes, the French folklore of Canada and the Spanish folklore of Mexico and California. The study of folklore is not entirely for amusement or curiosity. By comparing the records thus collected of ancient peoples and times, much is learned of the relation of races and languages to each other, thus adding to the materials for the studies of ethnology and philology. See *Custom and Myth*, Lang; *Myth and Mythmakers*, Fiske; and *Curious Myths of the Middle Ages*, Baring-Gould.

Fol′licle, a dry pod-like fruit which splits down one side. See FRUIT.

Fond du Lac, Wis., county-seat of Fond du Lac County. Lies in a fine farming district at the head of Lake Winnebago, has three railroads and manufactures lumber, sash, doors, blinds, agricultural implements, leather, boots and shoes, caskets, tents, awnings, refrigerators, furniture, saw-mill machinery, overalls, workshirts, typewriters, tables, dustless brooms and boats. The high school, court house, opera-house, Elks' Club, Masonic Temple, St. Agnes' Hospital, Grafton Hall (girls' seminary), Y. M. C. A., armory, postoffice and a number of churches are its principal buildings. It is lighted by electricity, has extensive waterworks, 25 miles of paved streets, and is noted for the excellence and number of its artesian wells. Population 18,797. Fond du Lac is an excellent example of the development of natural resources by business enterprise.

Fontaine. See LA FONTAINE.

Fontainebleau (*fôn′tăn′blō′*) a town in France, beautifully situated in the midst of a forest, near the left bank of the Seine, 37 miles southeast of Paris. It is chiefly famous for its chateau, the pleasure-palace of the kings of France. Founded by Robert the Good in the 10th century, it has been added to by almost every king of France, so that it bears the architectural style of almost every century. It was here that Pope Pius VII was detained a prisoner for nearly two years by Napoleon, and here also Napoleon signed his act of abdication in 1814. The forest surrounding the chateau covers 65 square miles. The modern city furnishes a great deal of wine and fruit for Paris, and has manufactories of porcelain. Population about 15,000.

Fontenoy (*fônt′nwä′*), a village in Belgium, the scene of a battle on May 11, 1745, between the French, 60,000 strong, and the English, Dutch and Austrians in equal force. After a hard fight the allies were forced to retreat, the loss on each side being about 7,000 men.

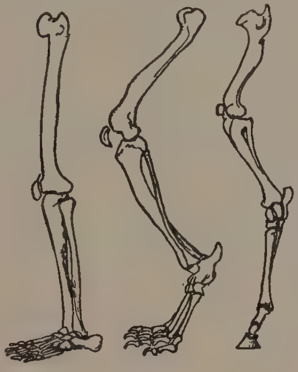
Foochow or **Fuchau,** the capital of the Chinese province of Fu-chien or Fukien is situated on Min River, 25 miles from its mouth. The town proper is surrounded with walls nearly 30 feet high and 10 feet wide at the top. The trade is principally in tea, the shipments in 1897-98 amounting to nearly a million pounds sterling or close upon six million Haikwan *taëls.* The imports are opium, cotton goods and lead, whose total value in 1905 was over seven million *taëls.* It was opened to foreign commerce in 1842, and is one of the largest mission-stations in China. Lines of the imperial Chinese telegraph connect Fuchau with Shanghai, Amoy, Canton and Ningpo. Population 624,000.

Food, that which nourishes. Foods are varied, those of the animal kingdom being vegetable and animal substances or products, together with certain mineral salts. In the broad sense water and oxygen are foods. Physiologists distinguish between foods and foodstuffs. A food is an article of diet that may be composed of one or more foodstuffs. For example, bread is a food, composed of starch, gluten, fat, water and various mineral salts, and the latter are foodstuffs. There are four main groups of foodstuffs: Starches and sugars, made of carbon, hydrogen and oxygen and called *carbohydrates;* butter, oils, fat and the like, made also of carbon, hydrogen and oxygen in different proportions and called *fats;* lean meat, white of egg etc., made of carbon, hydrogen, oxygen and nitrogen and called *proteids;* and water and mineral salts, called *inorganic foods.* Foods usually are insoluble and, when suspended in water, will not pass through a membrane. The object of digestion is to render them soluble and capable of passing in solution through membranes. This is different from assimilation, which consists of the processes by means of which the digested food is built into living tissue. Food is used to make good the constant loss that occurs in all living beings. It stands to reason that the food, in order completely to nourish the body, must contain all the chemical elements of which that body is composed. These chemical elements are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus and various other elements in very minute quantities. It will be seen, therefore, that proteid substance in some form must be a part of the food, in order to supply nitrogen, since carbohydrates and fats contain only carbon, hydrogen and oxygen. Milk and eggs are good examples of complete foods. For physiological reasons a mixed diet is best. Green plants, unlike animals, are able to make use of compounds like water and carbon-dioxide, and, by means of the energy derived from the sun's rays, build these into carbohydrates, as starch and sugars. These may be used in conjunction with nitrates to manufacture their protoplasm, which is endowed with life. The construction of starch etc. requires energy, and, by the well-known law of conservation of energy, the substances thus formed are endowed with potential energy. The agent that enables plants to utilize the energy from the sun, is their green coloring matter (chlorophyll). Animals must start with complex substances already endowed with energy, and, therefore, require carbohydrates, fats and proteids. The food is the source of energy to the animal-body. See BREAD, BUTTER, FLOUR, MILK, etc.

Food, of plants, consists of materials suitable to be used, without the expenditure of much work upon them, for the formation and repair of the plant-body. Foods for plants therefore are essentially the same as for animals, which is to be expected because the protoplasm is alike in the two. The food of green plants is not different from that of others, but they alone have the power to make food in the green cells under the action of light. (See PHOTOSYNTHESIS.) No other living things possess this power; hence the world is dependent on green plants for its food and for all the fuel whose energy drives its machinery. Carbon-dioxide and water are not properly called plant-food, being the material out of which some foods only are made.

Fool. See JESTER.

Foot, the part of the limb upon which an animal stands when resting. A comparison of the foot in various animals brings out many interesting modifications. The limbs are composed of corresponding parts, but there is great variation as to the development and the number of parts in contact with the earth. In the human foot we distinguish the ankle or tarsus, the instep or metatarsus and the toes or phalanges. The heel rests upon the earth, and this condition is called a plantigrade foot. Other animals, like the cat and dog, walk on the toes or digits, giving a digitigrade foot. The heel is up in the air and the instep is lifted away from the earth. In deer, cattle, horses and other animals the elevation of the heel has been carried further, and the animal stands on the tip-end of a single toe; the heel, instep and digits are away from the earth, the tip-end of one only being in contact. These points are illustrated in the diagram; in this comparison of the hind limb of man, dog and horse the heel-bone, to which is attached the tendon of Achilles, forms a landmark. It, of course, is to be understood that the fore limbs of dog and horse have undergone similar modifications. The deer, cattle and other animals have an even number of toes, while the elephant with five, the rhinoceros with three and the horse with one are odd-toed. The horse has the most remarkable example of a modified foot; not only are the heel and instep off the earth, but the bones of the instep have become reduced to one, and the animal walks upon the tip of a single toe on each foot of the four feet. It has been shown by fossils in the rocks that the horse's foot has been derived from that of an original five-toed ancestor, by suppression and consolidation of parts. The geological history of these changes extends over more than two million years. (See EVOLUTION.) The word foot is also applied in zoology to the tube-feet of starfishes, the part of the body upon which snails and clams rest, the feet of crustacea, insects, etc.



FOOT

Foot'ball, an outdoor game of several varieties, played with a round or oval, inflated ball about 27 or 28 inches in circumference. The ball consists of a rubber bladder encased in a leather cover. The game is a very old one, and now has three main varieties: association-football, which is played extensively throughout the British empire; Rugby football, which originated at Rugby School, England; and American college-football, which is a local development of the Rugby game.

A form of Rugby football was introduced at Harvard University about 1870. It was soon taken up as an intercollegiate game, the rules altered from time to time by those meeting in the intercollegiate football conventions, and the distinctively American form of the game gradually evolved. The game is played upon a level, rectangular piece of ground 330 feet long by 160 broad. The boundary lines of this area should be plainly marked with lime or sawdust, to enable the referee to determine when and where the ball has gone out of bounds. There also are transverse lines crossing the field at intervals of every five yards, to enable the referee to determine readily how much ground has been gained by the side in possession of the ball. The end-boundary lines are called the goal-lines, and at the center of each stands a goal consisting of two upright posts 18 feet 6 inches apart, united by a crossbar at a distance of 10 feet above the ground. There are eleven men on each side, constituting a team. In general seven men play forward with the ball, and the remaining four somewhat back of them. The center-man or center-rush usually puts the ball into play. Immediately behind him on either side are the right and left guards, then the right and left tackles, and behind them the right and left end men. The quarter-back has a position somewhat behind the center-rush, the two half-backs a few feet behind him and the full-back farthest back of all.

The choice of goals and first possession of the ball having been determined by lot, the play is started by the ball being kicked off from the center-line to a distance of at least ten yards into the opponents' territory. During the kick-off, the side in possession of the ball must not be beyond the center-line, and the opposing side must be at least ten yards back of it. After the kick-off, any player who is on side, that is, between the ball and his own goal, may get possession of it and run with it towards the opponents' goal or pass it to one of his own side, provided he does not pass it forward, that is, to one who is ahead of him and consequently not on side. Having the ball in the vicinity of the opponents' goal, scoring may be made either by a drop-kick, that is, by kicking the ball from the field over the cross-bar of the goal, thus securing five points, or by securing a touch-down, that is, carrying it over the end-line and touching it to the ground behind the opponents' goal-line. A touch-down counts four points, and also entitles the side securing it to a try-at-goal. In case of a try-at-goal, the ball either is kicked out to be caught by one of the same side and kicked at goal by him from a point back of that from which he caught it, or is held to the ground by one player while one of his side kicks it at the goal. In either case, if the player succeed in converting the touch-down with a goal, that is, succeed in kicking the ball over the cross-bar of the goal, it adds one point to the score of his side. Another possible way of scoring is by means of what is known as the safety. In case a team is hard-pressed by its opponents who seem likely to secure a touch-down, if the oppressed side themselves touch the ball down behind their goal, they win the privilege of taking the ball out to the twenty-five yard line and of kicking it off from there. In that case, however, the opponents win two points.

When a player is running with the ball, he may be caught and stopped by an opponent. In this case, if he keep possession of the ball and say "down," the ball is again put into play by his own side from this spot, by means of a play called a scrimmage. In the scrimmage the teams line up, facing each other, the center-man passes the ball to one of his backs who kicks it down the field or tries to carry it towards the opponents' goal, his own team meanwhile trying to protect him, as far as the rules will permit, from the attacks of the opposing side. In case the ball is kicked out of bounds, it goes to the possession of the opposite side who usually put it in play in scrimmage.

It has been found desirable to prevent one side from keeping possession of the ball indefinitely by means of scrimmage-play, without making progress with it towards the opponents' goal. This is accomplished by means of a rule that if in three attempts the ball is not advanced by at least ten yards, it must either be taken back twenty yards or given over to the opponents. Consequently if, after two scrimmages, it seem unlikely that the required ten yards will be gained, the ball is usually kicked as far as possible down the field.

The game has developed into one affording considerable opportunity for the display of generalship on the part of its principal director and for a great variety of team-plays and tactics. The quarter-back and the captain generally use a code of signals to inform their men what particular plays to execute. The game has recently been severely criticised on account of its roughness, and new rules changing the nature of the play have consequently been introduced.

Association-football is older than either Rugby or American football, and is still popular enough in England to draw crowds of 100,000 people to its most important matches. The ball used is round instead of oval, it is played almost entirely by kicking it, the players not being allowed to carry it as in the other games, and a score is secured by sending it between the goal-posts of the opposing team, under the cross-bar. The posts are twenty-four feet apart, the cross-bar eight feet high. The players consist of one goal-keeper who alone is allowed to touch the ball with his hands, two backs, three half-backs and five forwards.

Foote, Andrew Hull, an American naval officer, was born at New Haven, Conn., in 1806. He entered the navy in 1822, and was appointed captain in 1849. In 1856 he carried by storm four forts at Canton, China. On the outbreak of the Civil War he organized and equipped the western flotilla, and in February, 1862, stormed Fort Henry. His services obtained for him the rank of rear-admiral and a vote of thanks from Congress. He died at New York on June 26, 1863. See his *Life* by Prof. James Hoppin.

Foote, Mary Hallock, American novelist and artist, was born at Milton, N. Y., on Nov. 19, 1847, and lived for some years in Colorado, Idaho and California. She then studied art in New York, and did much work in black-and-white for magazines and book-illustrations. Her residence in the west seems to have impressed Mrs. Foote, and led her to attempt the delineation in fiction of frontier and mining life, and of scenes steeped in local color, characteristic of the west. Her success has been great, especially in such stories as *The Led-Horse Claim; John Bodewin's Testimony; Cœur d'Alène;* and *The Chosen Valley.* Other romances and novels include *In Exile and Other Stories*, *The Cup of Trembling*, *A Story of a Dry Season*, *The Last Assembly Ball*, *The Desert*, *The Sower*, *A Touch of the Sun* and other stories.

MARY HALLOCK FOOTE

Forage-Crops. See FEEDING-STUFFS.

For'aker, Joseph Benson, United States senator and jurist, was born near Rainsboro, O., on July 5, 1846. When the Civil War broke out, he enlisted in an Ohio regiment and served throughout the struggle, gaining the rank of first lieutenant and brevet-captain. In 1869 he graduated at Cornell University (N. Y.), and, being admitted to the bar, practiced law at Cincinnati, and was elected judge of the Cincinnati superior court. Resigning in 1882, from ill-health, he became active in politics, and from 1886 to 1890 was Republican governor of Ohio. In 1896 and in 1902 he was elected to the United States senate, where his ability as a debater and constitutional lawyer gave him prominent rank.

Forbes, Archibald, a special correspondent of the London (England) *Daily News*, was born in Scotland in 1838. He was educated in Aberdeen University and served in the Royal dragoons. In 1870–71 he acted throughout the Franco-German War as war-correspondent, also throughout the Russo-Turkish campaign in 1877–8 and the Zulu War of 1879. He was noted for his feats of audacity in securing items of news, and his ride of 110 miles in fifteen hours to report the victory of Ulundi, in 1879, is considered his greatest achievement. Mr. Forbes ranked high as a writer of short, stirring war-stories. Among his books are *Experiences in the Franco-German War; Memories and Studies of War and Peace;* and memoirs of *Havelock; Sir Colin Campbell; William I of Germany; Napoleon III* and *Chinese Gordon.* He died in London on March 31, 1900.

Forbes, John Colin, was born in Toronto, Canada, in 1846, but studied in London, England, at the Royal Academy When he returned to Canada, success came immediately, especially as a portrait-painter. His portraits of Sir John A. Macdonald, Mr. Gladstone and Lady Helen Blackwood have been much admired. He recently had the great honor of securing sittings from King Edward and Queen Alexandra.

Force, in physics, always means the product of *the mass of a body* and *the acceleration of the body.* If we denote the mass of a body by m and its acceleration by a, then the force F, which is acting upon the body, is given by the following defining equation:

$$F = ma.$$

Strictly equivalent to the preceding definition are the following two: *Force is the time-rate at which the momentum of a body is changing;* and *Force is the space-rate at which the energy of a body is changing.* Sometimes force is assigned an objective existence, and is spoken of as the *agent* which changes the momentum of a body. But, so far as is known, the only things in nature which have an objective existence are *matter* and *energy.* The physicist, therefore, prefers to use force merely as a measure of a certain ratio, namely, the rate at which momentum changes in the time. It is important for the student to observe that the momentum of a body may be changing even while the body is at rest, as is the case with a pendulum-bob at the end of its swing. In like manner a body may be in rapid motion and be acted upon by no force, as is the case with a pendulum-bob when passing through its lowest point.

Moment of force is a quantity which plays the same rôle in rotation that force plays in translation, and it is defined in a strictly analogous manner. Moment of force acting upon any body is measured by the product of the *moment of inertia of the body* and the *angular acceleration* of the body. Or, what is the same thing, moment of force is the time-rate of change of the angular momentum of the body. Or, still again, moment of force is the angular rate at which the energy of the body is changing. For *unit of force* see DYNE and DYNAMICS.

In popular usage force is a very much-abused word, and is misused often to indicate acceleration, momentum, power, energy etc. The student of science cannot be too careful in avoiding this error.

Force-Pump. See PUMP.

For'est. Forests may be considered as the climax of the world's vegetation, but conditions favoring their development do not exist everywhere. There are many types characteristic of different regions. The prevailing type of temperate regions is the deciduous forest. Sometimes it is nearly pure, as in beech-forests, oak-forests, etc.; but the more common type in the United States is the mixed forest, consisting of a mingling of numerous trees, as maple, elm, hickory, oak, beech, walnut, poplar, gum, etc. The deciduous forests of the United States are much finer than those of Europe, where the varieties are not so numerous and the trees are not so well-developed. Coniferous or evergreen forests are common in mountain regions and on sterile soils, extensive forests of this kind occurring in the lake-states, gulf-states and in the western mountains. The greatest of all forests are in the rainy tropics, as in the Amazon region, where the forests form jungles dripping with moisture, the trees being interlaced with vines and covered with air-plants. The scientific handling of forests is called forestry, (see FOREST-SERVICE) which involves not so much the preservation of forests, as proper care and cutting, by means of which they may be preserved and still yield the timber necessary for the world's use. A division of forestry has been organized by the Department of Agriculture in Washington, which has charge of this subject in the United States. Foreign countries, as France and Germany, are far in advance of the United States in the proper management of forests.

Forest-Reserves are areas reserved for the preservation of forests and the protection of other natural resources. They are withdrawn from occupation, except conditionally. The national reserves are called national forests, and number 160 in the United States, including four in Alaska and one in Porto Rico. There are four state-forests.

The law as to national forests encourages every industry that will not jeopardize their safety and maintenance. Each is subject only to restrictions that prevent waste and injury to the forests. Any settler can obtain $20 worth of timber a year for home-purposes free. The forester marks the trees, and the pioneer cuts them. Should the settler need more than $20 worth, he files an application, and in 1911 over 40,000 such free-use permits were issued. Only mature trees may be cut. They must be so cut as not to hurt young growth. Tops and brush must, if necessary, be burned. Cutting must begin within six months from the date of the permit, and be completed within a specified time. For municipal and mining purposes the government grants rights of way. It also issues grazing permits; lets cattle be driven through the forests between pastures outside; and builds driveways for stock in reserves where grazing is not allowed.

Location and Acreage of National Forests.

Arizona	13,883,452
Arkansas	1,184,012
California	21,104,069
Colorado	13,408,138
Florida	318,960
Idaho	18,139,435
Kansas	156,376
Michigan	84,011
Minnesota	844,473
Montana	16,192,504
Nebraska	521,065
Nevada	5,424,254
New Mexico	9,810,522
North Dakota	6,224
Oklahoma	61,028
Oregon	13,740,139
South Dakota	1,073,760
Utah	7,201,695
Washington	9,914,314
Wyoming	8,420,497
Total	141,488,928
Alaska	26,643,260
Porto Rico	32.975
Grand Total	168,165 163

California has the largest, North Dakota the smallest, national forests. The New York reserves are mainly in the Adirondacks, but partly in the Catskills; the Pennsylvania ones at the heads of its three principal rivers.

Forest-Service is a branch of the Department of Agriculture that cares for the national forests and also promotes forestry throughout the country, forestry being the art of growing forests and keeping them up. The service originated in 1897 when Mr. Cleveland was president, and until Feb. 1, 1905, was under the Department of the Interior. It comprises the office of the forester and four branches. These are operation, silviculture, grazing and products. The forester's office includes inspection, law, information and dendrology, the science that deals with the natural history or life-story of a tree. Operation includes maintenance, accounts, organization, engineering and lands. Silviculture includes extension, silvics and management, silvics being the science that treats of a forest. Grazing includes control and development. Products include wood-utilization, wood-preservation and publication. The forester is Henry S. Graves, and his force in 1911 numbered 2,624 men. Positions are filled by civil service examinations, and technical qualifications of a high order are required

The work was begun because our forests are disappearing so rapidly that it is calculated that they will be exhausted within 20 years. Another reason for trying to save them is that the water-supply and the soil depend on the forests. Where forests abound, the rain falls often and is kept a long while by the forest-soil, which is a kind of sponge, so that the streams have a steady supply and the flow and depth are regular. Where forests have been destroyed, the rain falls irregularly and flows away in floods at once. These cause great loss, and carry the soil away. This is called erosion, and a billion tons of fertile earth are taken to the sea every year by our rivers, while these themselves remain shallow and fill with stones and sand. So the saving of the water, on which agriculture, irrigation, the making of electricity, inland navigation, mining and even manufacturing all so largely depend, is a chief aim of the forest-service, as well as the preservation of a permanent supply of timber.

Already efficient protection for forests has increased the flow of their streams 25 *per cent*. Grazing lands, in the national forests, that had been almost ruined have begun to recover. Fire, the forest's worst foe, is so successfully fought that in 1907 only one eight-hundredth of the forest reserves had a fire, though their area is over 158,000,000 acres, and only three ten-thousandths were destroyed. At the same time new kinds of timber are being brought into use, with new ways of using and preserving old kinds, and the states and the private owners of forests are assisted in many ways.

Forge, a fire intensified by air-blasts. Forges formerly were generally made of bricks, the air being forced up beneath the fire by means of a bellows. They now are made of wrought or cast iron, and may be moved about from place to place. In former times forging was one of the most important arts in engineering and required expert workmen, but the steam-hammer and other like inventions of the present day have made forging a mechanical work. One of the largest forging machines in the world makes 600 to 1,200 strokes a minute.

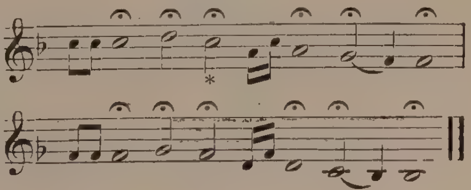
Forget-Me-Not, a term applied to a flower of which there are many species, and accounted for by various legends. The flowers in the common forget-me-not are small, have five petals and are of a medium shade of blue.

Form, in music, a term of as wide application and significance in music as in philosophy. From a very common use forms of music may be classified according: (1) to the character of the tonal embodiment or mode of expression, *i. e.*, vocal and instrumental, choral and orchestral; (2) function in social and religious life of peoples, *i. e.*, secular, ecclesiastical, religious; (3) inner character or nature of the subject defined, *i. e.* lyric, dramatic, programatic; (4) structural ordering, *i. e.*, contrapuntal, polyphonic, monophonic, binary, ternary, first-movement, rondo, cyclical; (5) melodic material, *i. e.*, monodic — one primary melody with various modes of accompaniment; polyodic — each accompanying melody having a true and characteristic melodic significance, for example, Chopin's *Étude in C-sharp minor*; monothetic — one theme, treated in various ways in all the voices, as in the canonic and fugal forms; polythetic — more than one theme, as in the double and triple fugue, the suite, sonata, etc. Each of these classes contains a variety of individual forms, *i. e.*, vocal includes many types of song, the chorus, oratorio, part-song, madrigal, glee, etc. Under ecclesiastical heading are to be classed the hymn-tune, choral, mass, liturgical forms like the Gregorian tones, chants, responses, etc. and Bach cantatas.

Strictly speaking, form applies to two distinct aspects of musical conception; first, to the anatomical or architectural ordering of the rhythmic, harmonic and melodic content; second, to the plastic, the æsthetic molding of the tonal expression of the melodic and harmonic ideas through the application of rhythmic nuances, dynamic intensities, shadings and accents, modes of articulation and the wonderful varieties of tone-color. Hold a leaf to the light and look *through* it, and there is seen a very complex system of the individual elements of ribs, veins, cellular tissues, etc. in characteristic relations; that is the structural, architectural design, form and unity of the leaf appealing to the intellect. Look again *at* the leaf and note the beauty of its rhythmic outline and symmetry, the warmth of its coloring and the delicacy of its aroma; that is the plastic, the æsthetic, the vital form reaching the heart. No work of art is of value that does not involve both these conceptions of form, and he only is an artist who, in conception and expression, realizes the beauties both of the structural and the æsthetic form of a work of art, be the art what it may — in this case, music.

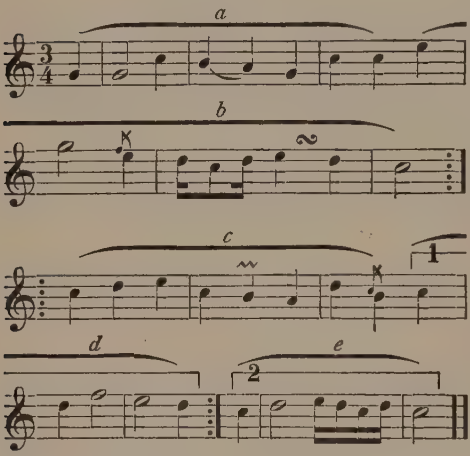
A few simple melodies will suffice to illustrate the primary elements of structural form in music. We will begin with the tribal prayer of the Omaha Indians.

EXAMPLE 1



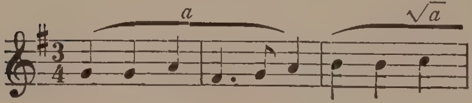
In this most tenderly beautiful choral we have the first simple melodic unity. Two melodic ideas, *a*, *b*, called phrases, are made clearly apparent through harmonic and melodic progression. The first cadence at * involves the definite conception not only of progression but of necessity for a succeeding phrase, expressing a definite relation — in this case, a sense of antithesis. The two phrases stand, therefore, in the relation of thesis and antithesis, and the unital idea may be called a strain. Strain, therefore is a primary form — a *norm*, used in the structural development of music; just as the unity of subject and predicate, called a sentence, whether represented by single words or phrases, is a structural element of poetry; and the arch, a structural element of architecture. In the following old French song, *Gabrielle Charmante*, the phrases *c* and *d* constitute a strain of a somewhat different character from the strains *a* and *b*. The second phrase (*d*), because of cadential treatment, expresses this idea of a complementary rather than an antithetical phrase to *c*. Phrases *c* and *e* are decidedly thetical and antithetical, as also phrases *a* and *b*. The strain, therefore, may be in two forms, according to whether the two terms (phrases) are relatively thesis and antithesis or thesis and complement.

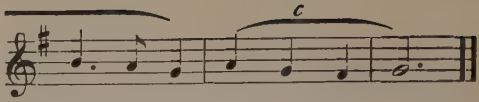
Example 2



Each of these terms, thesis or antithesis, may be strengthened by some form of reiteration, one illustration of which is found in the first strain of *My Country, 'tis of Thee.*

Example 3

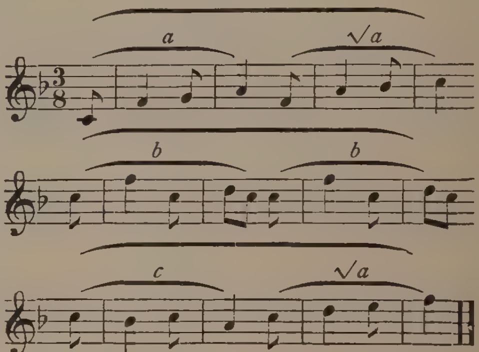




The thetical feeling of phrase *a* is strengthened by phrase √*a* not so much by the likeness in melodic design as by the rhythmic and especially by the cadential reiteration. This strengthening of the thetical element of the strain is quite common. The reiteration of the antithesis also occurs, but more rarely.

A very different form of two-phrase structure is illustrated in the following old folk-song:

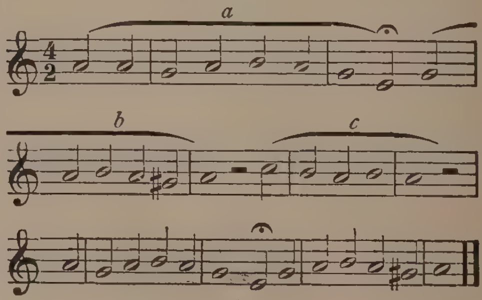
Example 4



Phrase √*a* is clearly a modified form of *a*, and closes with a like cadence. The two phrases, however, constitute a distinct unity, the second phrase not being a mere repetition. Such a two-phrase structure may be termed a couplet. A couplet involves a thesis and some modified form or intensive reiteration of the thesis, with definite cadential relations. Like the strain, the couplet is an elementary unit of thought — a norm. Unlike the strain, the couplet always is a dependent idea, while the strain may be dependent or constitute a completely independent melodic idea as in Example 1.

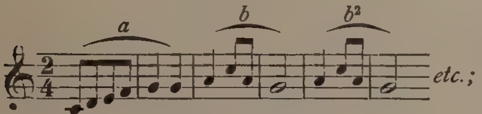
Another unit of thought — a norm — is illustrated in the following old German choral:

Example 5



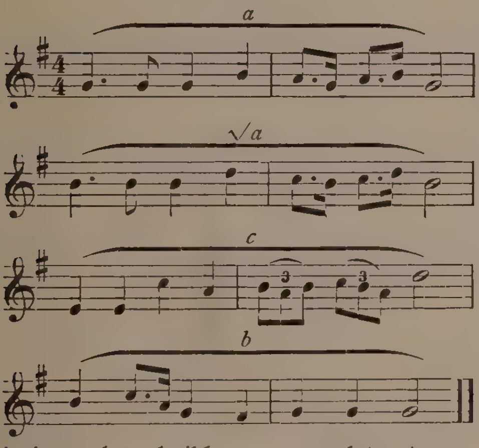
In this example a single phrase is used as a distinct unit of thought, standing in somewhat the relation to the preceding *a b*, and succeeding a^2, b^2, strains, that the second couplet, *b b*, in Example 4, sustains to the couplet *a a* and strain *c a*, between which it stands. In the following old folk-song the phrase as a distinct unit of thought is used in the form of an echo:

Example 6



and in the chorus of *Hail Columbia*

Example 7



it is used to build up a complete stanza-form. It is also to be met with as a kind of parenthetic interpolation and as a refrain. The strain, couplet and phrase, then, are the primary units of thought involved in all the large structural and æsthetic forms of music.

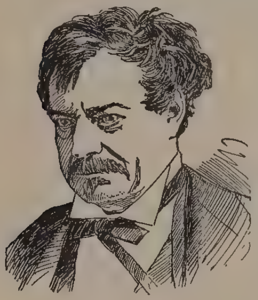
In a simple way we see how the melody of Example 1 is a compound idea, for the second strain is not a repetition, but an æsthetic development, a more intense, more deeply solemn utterance of the spiritual significance of the prayer. This greater impressiveness is the result of the relation in tonality of the two strains and the tone-stratum in which the second strain is sung. The first strain is clearly in the dominant key, and the second in the tonic. This is a specimen of a rare type of what is called binary form, to be found, so far as the writer is at present aware, only in very simple primitive folk-songs like the above. A second more common type of binary form is illustrated by Example 2, when the second part is developed out of new melodic material. The most common type of the binary form, however, is where the second strain, stanza or strophe introduces new melodic material in relation with that derived from the first part. This is frequent in two-strain folk-songs and the simpler folk-dances, especially in their idealized forms, *i. e.*, Bach's minuets, written for children.

In Example 4 are to be discerned three distinct parts, the third of which is a repetition of the first. This is termed the ternary (three-part) form. This type of structural design is probably more commonly followed than any other. If space permitted, it could be shown that, in general, this design is the essential basis of well-developed fugues, dances of all kinds, the so-called first-movement form, the rondo, the finale and the aria.

It remains to point out one more highly significant form, illustrated in a most elementary way by Examples 7 and 5. In this form the ideas (in Example 7 phrase-units, and in Example 5 couplet and strain-units of thought) follow one another with ever-increasing intensity of interest and spiritual force, embodying, like the sonnet, that poetic form which it most closely resembles, the innermost "holy matters" of the heart, such as may appear only in "a letter [song] from the poet [singer] marked 'confidential.'" Bach's first Preludein *The Well-Tempered Clavier* is a most simple but wonderfully significant and beautiful specimen. C. B. Cady.

Formo'sa or **Taiwan,** an island, now belonging to Japan, lying off the coast of China, having a length of 235 miles and a breadth of from 70 to 90 miles. Its area is 13,458 square miles. The highest mountain is Mount Morrison, 12,487 feet high. The island is famous for its vegetation, many of our rarest hot-house plants growing wild on its mountain-sides and in the valleys. Camphor and teak-trees, pines, firs, bananas, bamboos and palms are there in profusion. There are 43 species of birds peculiar to the island, and fish are plentiful along the coast. The principal products of commerce are tea, sugar, coal, camphor, rice, sweet potatoes, bamboos and rattan. The island was ceded by China to Japan in 1895. Taiwan, which is a treaty-port, is the capital (population 50,000); and the other chief towns are Tamsui and Kelung. The population of the island is estimated to be about 3,392,063, including about 50,000 Japanese. Its commerce is now largely with Japan, though there still is considerable trade with China, as also with the United States. There are 230 miles of railway, besides 125 miles of a light railway line; there is also a telegraph service with 88 offices open and over 1,100 miles of line. Its mineral resources are being developed, including gold, silver, coal, petroleum and sulphur. In 1905 the exports amounted in value to 60 million *yen* (the *yen* having a value of about 50 c.); while there was a like volume and value of imports. The Japanese administration has effected much improvement in the way of sewerage, water-works, the establishment of hospitals and schools, as well as manufactures. The camphor-industry, together with the fisheries, has been extended, in addition to its agricultural interests. See Guillemand's *Cruise of the Marchesi*.

For'rest, Edwin, a celebrated actor, was born at Philadelphia March 9, 1806. He first appeared on the stage in 1820, and at 20 played as Othello in New York. He appeared with success in London in 1836 and 1837, but injured his reputation there by hissing Macready. He made his last appearance in the part of Richelieu at the Globe theater, Boston, in 1871, and died of paralysis on Dec. 12, 1872. His acting of Lear, Othello and Coriolanus was greatly admired. With him the line of great American actors began. See *Life* by the Rev. W. R. Alger.



EDWIN FORREST

Forrest, Nathan Bedford, a Confederate general, was born in Bedford County, Tenn., on July 13, 1821. He raised a cavalry regiment at the outbreak of the Civil War, and was engaged in the battle of Shiloh. He was an able and daring cavalry leader, commanded the cavalry at Chattanooga and fought at Chickamauga. In April, 1864, he captured Fort Pillow; was promoted to be lieutenant-general in 1865; and surrendered at Gainesvillen on May 9 of the same year. Forrest died at Memphis, Tenn., Oct 29, 1877.

Forrest, Sir John, LL. D., explorer and administrator, was born in Western Australia on Aug. 22, 1847. Entering the surveying department in 1864, he was assigned the command of the expedition which went in search of Dr. Leichhardt in 1869. The following year he commanded the expedition from Perth to Adelaide along the shores of the Great Australian Bight. In 1874 he headed the 2,000-mile journey without camels from Champion Bay to the overland telegraph line between Adelaide and Port Darwin through the center of Australia. For this achievement he received a substantial reward from the government and the gold medal of the Royal Geographical Society. Sir John was the first premier and treasurer of West Australia under responsible government, leaving this office to become minister of defence of the Commonwealth of Australia (1901-1903), then taking the ministry of state for home affairs, which he held until 1904. He was responsible for the building of the great harbor at Freemantle and for the water-supply for the Coolgardie gold fields. He has published *Explorations in Australia* (1876) and *Notes on Western Australia* (1884 to 1887).

For'ster, William Edward, an English Liberal statesman, was born in Dorsetshire on July 11, 1818, and died at London on April 5, 1886. He was of Quaker ancestry, and was educated at the Friends' school in Tottenham. Settling at Bradford, he engaged in the manufacture of woolens, in which he made a large fortune. In 1861 he entered Parliament and took an active interest in education; was vice-president of the council of education; and carried through the elementary educational bill of 1870 and the ballot-law under the Gladstone administration. In 1874 he visited the United States, and on his return was elected lord-rector of Aberdeen University. In 1880 he became chief secretary for Ireland in Mr. Gladstone's cabinet, and sought to grapple with Irish affairs; but, owing to disagreements with his chief on his leniency toward Parnell and the Land-Leaguers, whom he sought to coerce by drastic legislation, he resigned, and thereafter was at issue with Gladstone over his Irish policy. He was held in high esteem in Parliament for his honesty and independence of character, though from Irish partisans he earned the title of Buckshot Forster from the severity of his views in respect of Irish sedition.

Fort Dodge, Ia., the capital of Webster County, on Des Moines River, 90 miles northwest of Des Moines. Its railroad connections are furnished by the Mason City and Fort Dodge, Illinois Central and Minneapolis and St. Louis railroads. It has good schools, churches, a college and a Roman Catholic seminary. Its industries include one of the largest oatmeal-mills in the state, besides coal-mines and gypsum-quarries in the vicinity. A former fort here was called Fort Clarke. Population 15,543.

Fort Don'elson, an historic post in Tennessee, on Cumberland River, 12 miles east of Fort Henry. It was strongly fortified by the Confederates during the Civil War, and in 1862, when held by General Floyd with 15,000 troops, was attacked by Commodore Foote, who was driven back. But the forces of General Grant, coming up from the capture of Fort Henry, defeated the Confederate force, which came out of the fort to meet them. General Floyd and a part of his force escaped during the night, and the following day General Buckner, who was next in command, surrendered with about 14,000 men.

Fort Fisher, Battle of. In December of 1864 General Grant sent an expedition against Fort Fisher, which commanded the entrance to Cape Fear River, below Wilmington, North Carolina. The force consisted of 6,000 troops under General B. F. Butler and a fleet of ironclads under Admiral Porter. After a bombardment, which continued for two days, an assault was attempted on Dec. 24, but was abandoned without serious fighting, the works being deemed impregnable. General Grant was dissatisfied with the result, and two weeks later sent General Alfred H. Terry with 8,000 men and a fleet, as before, under Admiral Porter to renew the attempt. Under cover of a bombardment by the fleet, the troops were landed on Jan. 13. The next day the works were stormed, and after a desperate and bloody hand-to-hand struggle, they were carried. Two thousand prisoners and 169 heavy guns were captured.

Fort Francis is on Rainy River, one mile from Rainy Lake (Ontario), and on the main line of the Canadian Northern. It is the Canadian terminus of the Duluth and Rainy Lake and Minnesota and International railways. It also is the terminus of the Rainy River Navigation Company. There is a fine waterpower at this point (Alberton Falls) where 30,000 H. P. are being developed.

Fort Henry. See FORT DONELSON.

Fort Madison, county-seat of Lee County, Iowa, is 18 miles from Burlington. In 1832 the town was established and took the name of the fort built there in 1808. Chief among its manufactures are agricultural implements, automobiles and shoes; besides, the city has flour and lumber-mills, railroad-shops and pork-packing establishments. It is served by the Atchison, Topeka and Santa Fe and the Chicago, Burlington and Quincy. Population 8,900.

Fort Moultrie is on Sullivan's Island, situated at the entrance to Charleston harbor, South Carolina. It was first built of palmetto-logs and earth, mounting 26 guns, and was unsuccessfully attacked by a British fleet of nine vesesls, mounting 270 guns, in 1776. It was afterward rebuilt in masonry. In the Civil War it fell into the hands of the Confederates, when Major Anderson abandoned it for Fort Sumter in December of 1860.

Fortress Monroe, a fort built on Old Point Comfort, Virginia, to defend Hampton Roads and the approach to Norfolk. It has within it detached buildings for officers' quarters, barracks, storehouses, arsenal, workshops, the artillery school etc. It can mount 187 guns. The fortress is six-sided, and is surrounded by a wet ditch, outside of which are batteries. It covers 80 acres, and cost $2,818,000. It is the largest fort in the United States.

Fort Scott, Kan., the capital of Bourbon County, on Marmaton River in southeastern Kansas, 96 miles south of Kansas City, is the center of a region rich in bituminous coal, cement-rock deposits and extensive flagstone-quarries. The chief revenue is derived from its two railroad-shops, which employ more than 1,000 hands. Besides, there are manufactories of brick, machinery and syrup. Fort Scott is the largest horse and mule-market of the state. The buildings, chiefly those of the national and county governments, are substantial and commodious, and the city is attractively situated. For some reason, however, its population has not grown in the past decade: it now numbers 10,463 inhabitants.

Fort Smith, Ark., a city on the Arkansas River, on the western confines of the state and adjoining Oklahoma. Here is a United States military reservation devoted to educational purposes, and the city school system consists of nine schools with 85 teachers and 3,500 pupils. It lies 160 miles northwest of Little Rock, and is the seat of the United States district-court of the western district of Arkansas. Its factories include mills, iron-foundries, machine-shops, furniture and wagon-factories etc. It is served by seven railway-systems. Population 23,975.

Fort Sumter, a fort built on an island near the entrance to the harbor of Charleston, S. C. When fully equipped, it was to have 140 guns in three tiers; but at the close of 1860 it had not been finished. In December of that year Major Robert Anderson, who was in command, transferred the garrison of Fort Moultrie, only 109 men, to the new fort, on learning that he was unsafe from attack in the old fort. He could mount only 52 light guns. From January to April, 1861, the fort was, in fact, besieged, as President Buchanan had refused to hand over the South Carolina forts to the state government. On April 11 the South Carolinians demanded the surrender of Sumter; and, on this being refused, notice was given that the bombardment would commence at four o'clock the next morning. The fort was seriously damaged by the firing from the shore, which lasted for several hours, but no one was hurt. As provisions and ammunition had given out, Anderson agreed to abandon the works, which he did on April 14. The firing on Fort Sumter was the beginning of the Civil War. The works were stubbornly held by the Confederates till Charleston itself was abandoned in February, 1865, and during the war they were the city's chief defense. The fort was, however, bombarded by a Federal monitor fleet, and later by batteries on Morris Island, and shot into a shapeless ruin.

Fort Wayne, the county-seat of Allen County, in northeastern Indiana, is 148 miles southeast of Chicago. It is situated at the head of Maumee River, covers nearly 15 square miles, and is the third city of Indiana in population. It is an important steam and interurban railway-center, has a large number of manufactures, including knitting-mills, car-wheel and machine-shops, agricultural implements and electrical apparatus, shirt waist and glove-manufactories, steam-engine works etc. The public buildings are exceptionally fine. It has many school-buildings and churches, and is the seat of a Catholic bishopric. Concordia College, a flourishing institution of the German Lutheran church, is located in Fort Wayne. Its population in 1900 was 45,115, and it has a present population of 63,933.

Fort William, situated on the north shore of Lake Superior, is four hundred and twenty-seven miles east of Winnipeg, at the mouth of Kaministiquia River. The river affords a natural harbor where vessels drawing twenty feet of water can sail for five miles, and both of its banks can be used for manufacturing sites. The city's population is about 10,000. It is the lake terminus of the Canadian Pacific and of the Grand Trunk. It also is on the Canadian Northern. The whole northwest is dependent on Fort William for the outlet of its products. Its growth is rapid and safe. Large sums are being spent by the government for improving its harbor, to better the facilities for handling the ever increasing business of the Canadian marine. The Olgilvie Flour-Mills Co., the Canadian Iron and Foundry Co. and other large industrial concerns are located here. The amount of merchandise brought into Fort William by vessel for transshipment is immense.

Fort Worth, a city and important railroad center in northern Texas, county-seat of Tarrant County, lies where the West and Clear Forks of Trinity River flow together, about 170 miles north of Austin. It is, next to Dallas, the most important railroad-center in northern Texas, and is the greatest horse and mule-market of the southwest. The country surrounding it is a rich farming region, producing cotton, grain and fruits. The water-supply is obtained from Clear River and two hundred artesian wells. In 1907 it had 60 miles of electric railways. The court-house, city-hall, chamber of commerce and high-school buildings are noteworthy, as are also several of the churches. The swimming-school, costing $70,000, is one of the institutions of the city. Besides large stock-yards and meat-packing establishments, here are the car-works and shops of the Fort Worth and Denver, Texas Pacific and Rio Grande railroads. The Roman Catholics have an academy, and Fort Worth University is located here, as is also a Polytechnic College. The city possesses an excellent public-school system, several business colleges and a medical school. There are rolling-mills, iron-foundries, a jute-factory, a woven-wire factory and manufactories of flour, cotton and woolen goods, leather etc. There was but one house within the city-limits in 1872; the number of its inhabitants in 1876 was only a little over 1,000. The population, which in 1900 was 26,688, is at present 73,312.

Forth, a river and firth of Scotland. The river is formed by two head-streams, the Duchray and the Dhu, rising within a mile of Aberfoyle and not far from Ben Lomond. The Firth of Forth extends 51 miles eastward from Alloa to the German Ocean. Its waters are from three to thirty-seven fathoms deep. In 1882–89 a great railway bridge was built across the firth at Queensferry, being one and a quarter miles in length.

For'tifica'tion is the military art of strengthening a place against the attack of troops. There are two branches, called field and permanent fortification. Field-fortification includes such slight intrenchments and field-defenses as can be thrown up by the troops themselves during the few hours before a battle, as well as fieldworks requiring days or weeks to build. Permanent fortification deals with engineering works for the defense of points of importance. Years may be spent in finishing them, and iron and masonry are largely used in building them. Field-fortification, while aiming at giving the defenders of a chosen position all the advantages of cover from the enemy's fire and of forcing him to advance over open ground swept by their fire, must also allow free movement for counter-charges. A position is made ready for attack by loopholing any buildings, which may stand on it, and the walls around them, strengthening the cover afforded by ditches and hedges along the front or by throwing up breastworks and digging rifle-pits, with deep trenches in the rear for supports and gun-pits for artillery. Parts of this line should be so placed as to flank an attack on the front, and no cover should be left for the enemy during his advance. Hollows, which cannot be seen from the front, should be filled with brushwood. To oppose the advance of the enemy an abattis is often used. This is a row of tree-branches, sharpened and laid with points outward. Entanglements are also used; either of brushwood cut halfway through and woven together with wire run through it or of several lines of barbed wire fastened to stakes. Only the more important points of such a position are really fortified by building field-redoubts, usually in the form of a square, forming strong points in the main line, advanced posts in its front or a second line of works in the rear. Often redoubts have only two sides meeting at a point in front; or they may be five-sided —two in front called the faces, two on the flanks and in the rear a lower side called the gorge. The faces and flanks are formed by parapets (meaning "guard the breast"), twelve to sixteen feet thick, to resist artillery. The gorge is shut in usually by a light parapet, say three feet thick, or by a stockade (a wall of bullet-proof timber). In building a redoubt a ditch is made in front. Sometimes sharp palings, called palisades, are planted in the bottom. The top or crest of the parapet is never more than twelve feet above the ground in a field-redoubt. Fieldworks of this kind can be built in from eighteen to twenty-four hours, and are able to withstand the fire of field-guns. Blockhouses are now only used in mountain-warfare, where artillery could not be used and timber is plentiful.

Permanent fortification, for the defense of cities, harbors, tracts of country, bridges, roads and the like goes back to the earliest times. Its aim formerly was to keep out the enemy, unaccompanied by counter-attacks, except sorties to destroy siege-works and batteries. Since 1859 detached works and free maneuvering ground between them for counter-attack have been used for permanent works as well as for field-intrenchments. This is due to the great improvement in artillery and small arms, cannon easily destroying the strongest works at long range and the breech-loading rifle increasing the power of armies in the open field.

In Greek history we read of cities surrounded with walls of brick, stone and rubble. Babylon had a wall of enormous length, 100 feet high and 32 feet thick, surmounted by towers. Jerusalem at the time of Vespasian's siege had like walls. But the square and round towers which had been defense enough against arrows, and the walls which had withstood battering rams, were soon found to be useless against cannon. Early in the 15th century the Italians began to flank their walls with bastions (built like the outer faces of a redoubt). This form of defense was carried to great perfection by the great Vauban, the engineer of Louis XIV. He built 33 new fortresses, improved over one hundred and himeslf carried on more than fifty sieges. Vauban's forts were in the shape of a polygon. The main body of the place is called the enceinte. Bastions are built out, and joined by a parapet called a curtain. A rampart is formed of the earth dug from the ditch, and a parapet is built on it. To protect the flanks an outwork on the far side of the main ditch is built, called the ravelin. As cannon became more powerful, the masonry had to be covered by what are called counter-guards. The enceinte or main fortification at Antwerp is a good example of the best modern modification of the old system of Vauban. The fortifications at Antwerp also show how the science has changed, outworks close to the enceinte being replaced by a chain of detached forts three to five miles from it. At Antwerp the forts are about a mile and a quarter apart and two to three miles in front. Each has 700 yards of front, 120 guns, 15 mortars and a garrison of 1,000 men. They are in the shape of square redoubts. If attacked, supporting batteries would be thrown up between them, and, before the main fortress can be reached, at least two must be captured, which would be very difficult in the face of an army which could be gathered in the 200 square miles shut in by the chain of forts. These forts are joined by a circular railroad. Since the war of 1870 the whole of France has been fortified in this way, making it a camp-fortress, as the Austrians say.

A seaport or dockyard must be fortified in a different way from an inland town, as the heaviest guns can be brought against it by the enemy's ships, and it can now be bombarded at a distance of ten or more miles. The first line of defense is made of submarine mines. To protect these, shore batteries are thrown up, able to drive back a landing party. Electric lights to discover the position of the enemy, guard-boats, swift steamers to scout in front and torpedo-boats are necessary. For the real defense the heaviest guns to be had are mounted. See *Military Engineering* by Prof. D. H. Mahan.

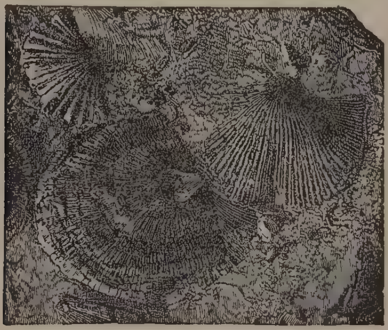
Fortu′na, called by the Greeks Tyche, was, in mythology, the goddess of chance. Pindar considers her a sister of the Fates. She differed from them, however, in working without law, conferring joy or sorrow as she pleased. She had temples at Smyrna, Corinth and Elis, and two statues of her at Antium were consulted as oracles. Greek poets and sculptors represented her with a rudder, with a ball or wheel or with wings. The Romans proudly said that when she entered their city, she threw away her ball and put off her wings and shoes, to indicate that she meant to dwell with them forever.

Fortune Bay, an electoral district of Newfoundland. Population (1901) 8,762; chief towns: Belloram, Garnish, Harbor Breton, Pushthrough and Bay d'Argent.

Fortuny y Carbo (*fō̂r-to͞o′nē̂ ē̂ kär′bō̂′*) **Mariano,** an eminent Spanish painter, was born at Reus, in Catalonia, in 1839, and studied at the Academy of Barcelona and in Italy. He was a vivid portrayer of domestic life in the east. Among his best-known works are *The Spanish Marriage* and *Academicians Choosing a Model.* He died at Rome on Nov. 21, 1874.

Fo′rum, the name applied by the Romans to a public space, especially to the market-place in a city, where public affairs were discussed, courts of justice held and money transactions carried on. In Rome the name was applied particularly to the famous *forum*, the low, level space extending from the foot of the Capitoline Hill to the north-eastern part of the Palatine.

Fos′sil. The body, the bones, the shells or any part or distinct trace of any animal or plant buried in the earth by natural processes is a fossil. Fossils need not be of great age, and the youngest are of recent origin. In some cases the bodies of the fossils, plants or animals are preserved. Trees buried by wind-drifted sand become fossils, though the wood is almost completely preserved. The bodies of mammoths have been found in the frozen earths of Siberia, the flesh still undecayed. They likewise are fossils. More commonly only the hard parts of animals, as the bones, teeth, shells etc., are preserved. In many cases even the substance has been replaced by mineral matter of a different sort. Thus, the lime carbonate of shells may be replaced by iron pyrites or some other substance, and the form of the shell reproduced in the new substance is a fossil. The woody matter of buried trees is sometimes replaced by mineral matter, as silica, and the structure of the wood is reproduced in the mineral substance. Wood which has been thus transformed is petrified. In other cases buried shells are dissolved out of their setting, and there remains only a cavity (mold), having the shape of the shell, to indicate its former presence. In still other cases the shell may be filled with sand or mud, and this filling may become hardened. The shell may then be dissolved, leaving the filling or cast. This also is a fossil. The tracks of animals made in sand or mud and preserved by burial or the impressions left by leaves buried in the sand or in mud are also fossils.



FOSSIL

For a long time these petrified remains of animals and plants were not understood. During the middle ages the most curious ideas were held regarding them. The ones most commonly observed at that time were the shells of animals no longer existing, and they were asserted to be discarded molds of the Creator or abortive creative attempts into which the breath of life was not introduced. Lionardo da Vinci, in the early part of the 16th century, had understood their true nature, declaring them to be the remains of ancient life. But this was forgotten, and it remained for Cuvier to announce it again at the close of the 18th century. Large bones were being exhumed at this time near Paris, and Cuvier, from his extensive knowledge of anatomy, showed that they belonged to animals no longer living. The fossils are of importance in telling the past history of life on the globe. If we gather those from the oldest rocks, we get an idea of the earlier forms, and the others in later-formed rocks, taken all together, show the succession of animal life in geological times. Many of the fossil forms are entirely extinct. Other forms lived on, underwent modifications and developed into the animals of to-day. Within the past years the knowledge of fossil life has been greatly extended through explorations, and students of animal life are making out the lines of descent of our different modern animals. O. C. Marsh, E. D. Cope and other Americans made extensive and remarkable contributions to our knowledge of fossil life. Much attention is paid to the restoration and reconstruction of fossil forms. The work in this direction that has been done at the American Museum of Natural History in New York city is noteworthy. Not only have reconstructions of lost parts been made, but picturesque restorations of the entire animals, by the artist, Mr. Knight, under the direction of Professor Osborn. The science of fossils is palæontology (which see). See *Harpers' Magazine*, Vol. XCIV., p. 674 (1897), *The Century*, Vol. LII., p. 705 (1896); *McClure's Magazine*, Vol. XV., p. 512 (1900); Cope, *Tertiary Vertebrates*, U. S. Gov. (1884); *Am. Nat.*, Vol. XXII. (1898).

JOHN W. FOSTER

Fos′ter, John Watson, American diplomatist, was born in Pike County, Ind., on March 2, 1836, and graduated from the University of Indiana. After taking a law-course at Harvard, he practiced law at

Evansville, Ind., where the also was postmaster for a time. He distinguished himself during the Civil War as major and colonel of Indiana regiments. Subsequently he held diplomatic appointments, being minister to Mexico (1873–80), to Russia (1881) and to Spain (1883–85). In 1892 he succeeded Blaine as secretary of state, and in the following year represented the United States at Paris in the Bering Sea arbitration. He has also acted as plenipotentiary in the negotiation of reciprocity treaties, and has acted as peace-commissioner and envoy of the United States in international arbitration. His history of American diplomacy is a final authority.

Fos'ter, Stephen Collins, an American song-writer, was born at Pittsburg, Pa., in 1826. His compositions number 125, nearly a fourth being negro melodies. The best-known productions are *Old Folks at Home*, *Come where my Love Lies Dreaming*, *Uncle Ned*, *Old Dog Tray* and *Old Kentucky Home*. He died at New York on Jan. 13, 1864.

Fouche (*fōō'shā'*), **Joseph** (Duke of Otranto), minister of police under Napoleon, was born at Nantes, France, on May 29, 1760. He was elected to the national convention in 1792 and expelled in 1794. In 1799 he was appointed minister of police, and held the office until 1815. He was a man of one ambition — his own political success. He was indispensable to Napoleon, yet was dismissed by him twice, but reinstated each time. He was given office by Louis XVIII, but dismissed by him in September, 1815. He was then appointed ambassador to Dresden, and, being included among those who were banished, as having been concerned in the execution of Louis XVI, he henceforth led an exile's life and died at Trieste on Dec. 25, 1820.

Founda'tion, the base upon which a structure is built or placed, as the foundation of a building, a bridge-pier or an engine. The object is to furnish a base which shall not settle or, if it does settle in the least, that this settling shall be perfectly uniform. The best foundation-base is solid rock, as this is firm and not affected by water, but some gravels and clays are equally good, if they are not saturated with water. The most difficult soils for foundations are soft, compressible earths saturated with water. Where it is possible, it is best to go down until rock, gravel or "hard-pan" is reached. It is often necessary to go down 75 or 100 feet to find such firm material. Where the soil is of a yielding nature, the area of the base must be so enlarged as to decrease the pressure per square foot to safe limits. A common method in soft soils is to drive piles, saw them off at the surface and erect the foundation on a platform on these piles. The whole of the Back-Bay district in Boston is on pile-foundations. Sometimes masonry, concreted timber or iron platform foundations are used. Thus in Chicago, where the soil is boggy and it is impracticable to reach good rock, the foundations of many of the heaviest buildings have been erected on an iron and concrete platform. A cubical pile of crossed iron-rails is made and filled in with concrete, and the building is placed on these. For foundation-bases under water, or under soils saturated with water, coffer-dams and caissons must be used to get the masonry-work down to a firm base. (See COFFER-DAM and CAISSON.) The Romans seem to have been the first to make a serious study of foundations. It is said that the sites of the cathedrals of the middle ages were selected primarily with reference to getting a suitable foundation, and that, even so, many mediæval structures have disappeared on account of improper foundations. The subject of foundations is one of the most important problems of modern engineering, and it is often found necessary to spend large sums in preliminary borings to determine the character of the soils.

Foundry, an establishment for casting. Casting consists in pouring a molten metal into a suitably shaped mold in which it cools and solidifies, thus forming a metallic figure of the shape of the mold. Metal-casting is as old as civilization, but it has been greatly developed in very recent times. Most metals can be cast, but iron, brass, bronze, zinc, aluminium and type-metal are the metals most used for casting in the industries. The molds are formed of loam, molding-sand, plaster of Paris or metal. In type-founding, steel molds are used. To form a mold in loam or sand requires a pattern. This pattern is usually of wood, but may be of metal. Pattern-making for casting parts of machinery forms a special trade. Iron is melted for casting in a furnace called a cupola. The principle of foundry-work is simple, but the practice of it requires much skill and special knowledge, and special treatises must be consulted for details of the work of a foundry.

Fourier (*fōō'rĭ-ẽr*), **Jean Baptiste J.,** a distinguished French physicist and mathematician, was born on March 21, 1768, and died at Paris, on May 16, 1830. He taught mathematics at Saint-Maur, at the Normal School and at the Polytechnic School in Paris, successively. In 1798 he went to Egypt with Bonaparte. Later he was appointed prefect of Grenoble in France, a position which he held for 14 years. It was while here that he wrote his immortal work on the *Analytical Theory of Heat*, which was published in 1822, and which has ever since remained a model in clearness and method for all writers on mathematical physics. It was this work which, six years after its publication, suggested to Georg Ohm, the German mathematician, the remarkably simple description of the manner in which electric currents flow through conductors, now known as Ohm's law. Fourier was quite as remarkable for breadth of culture as for special attainments in mathematics. At the same time with Cuvier he was perpetual secretary of the French Academy of Science.

Fowl. See POULTRY.

Fox, an animal closely related to the dog and jackal, but distinguished by the sharp muzzle, erect ears, vertical pupil of the eye and long, bushy tail. There are several kinds, common in different parts of the world, with the exception of South America. The one most widely distributed in this country is the red fox, which resembles the common fox of Europe and Great Britain, but is distinguished by slight differences. This animal is about thirty inches in the body and head, and the tail is about a foot and one half long. Its fur is a reddish-yellow, with the tips of the ears and tail black and a white line on the belly. There are several slight varieties differing in details of color. It is a clever and cunning animal, being often able to elude the hounds in the chase. The Arctic fox, which ranges southward to Labrador and Newfoundland, has beautiful silky fur, bluish or brown in summer and pure white in winter. The black fox or silver fox holds first place among fur-bearers; in London a single skin brought $2,784, and in this country skins not infrequently sell at from $600 to $1,200. The animal is jet-black, save for snow-white tip of tail and a few scattered white hairs low on its back.

CROSS FOX (a Variety of the Red Fox)

Fox, Charles James, the son of the first Lord Holland, was a British statesman, born on Jan. 24, 1749. He was educated at Eton and Oxford and at nineteen was elected to Parliament. He became an active supporter of the administration of Lord North, and was made an admiralty-lord. This office he resigned in 1772, and was next year appointed a commissioner of the treasury, from which he was dismissed when he went over to the ranks of the Opposition. During the American Revolutionary War, he was an opponent of the coercive measures toward the colonies adopted by the government, and was a strenuous advocate of the claims of the colonists. After occupying various other high offices of state, he died on Sept. 13, 1806, and his remains were interred in Westminster Abbey near those of Pitt. Burke called him "the greatest debater the world ever saw." See *Early History of C. J. Fox* by Sir George Trevelyan.

Fox, George, was the founder, of the Society of Friends, commonly called Quakers, and was born at Drayton, in Leicestershire, England, in July, 1624. At nineteen his religious convictions forced him into the belief that he was the subject of a special divine call, and, leaving home, Bible in hand, he wandered over the country, holding meetings. He not only was a great religious, but a great social, reformer. His dress, mode of speech and manners were different from others. He took off his hat to no one; addressed men and women as *thee* and *thou;* and opposed all unnecessary form in religious observance. He was persecuted and arrested, but the sincerity of his views was admitted. He visited America with Penn, Barclay and Keith. Fox died on Nov. 13, 1690. He was known as a lovable and Christlike man, with a heart full of love for his fellow-beings. See *George Fox and the Early Quakers* by A. C. Bickley.

France, the most westerly portion of Europe, lying between the Atlantic and the Mediterranean. France in its present limits covers 207,054 square miles, or one nineteenth of Europe, with a coast-line of 1,760 miles (1,304 on the Atlantic and 456 on the Mediterranean). It is bounded on the north by the English Channel and the Strait of Dover; on the northeast by Belgium and the grand-duchy of Luxemburg; on the east by Lorraine, Alsace, Switzerland and Italy; on the south by the Mediterranean and Spain; and on the west by the Bay of Biscay and the Atlantic. Its greatest length from north to south is 606 miles and from east to west 556 miles. Its land-frontier extends over 1,575 miles, of which 1,156 miles are along the Belgian, German, Swiss and Italian frontiers and 419 miles along the Spanish frontier.

Surface and Drainage. The country is divided between the lowlands in the northwest and a large tableland which covers the southeastern half, and on the south and southeast borders the slopes of the Pyrenees and Alps. The tableland rises in its highest parts from 3,000 to 4,000 feet, with deep river-valleys and mountain-chains, reaching 5,000 or 6,000 feet in height. The plain slopes toward the Rhône and the Mediterranean, fringed by the Cevennes Mountains, the highest peak being Mont Mezenc (5,754 feet). This chain of mountains separates two widely different regions: the fertile, sunny and warm plains of the Rhône and Languedoc and the plains of the Rouergue, dreary, cold and high, where only rye grows and flocks of sheep find rich grazing-grounds. Central France is the highest part of this tableland, a region of granite, gneisses and slates, with many extinct volcanic cones surrounded by wide sheets of lava. Puy-de-Saucy, 6,188 feet, is the highest peak of the Auvergne Mountains in central France. Besides the Cevennes, the mountain-ranges include the Pyrenees, the Vosges, the Jura and the Alps. The Pyrenees separate France from Spain, extending 260 miles, the highest peak, Néthou, being 11,168 feet high. The passes across the Pyrenees are few, lofty and difficult, the lowest being 6,700 feet high, so that railroads hug the seacoasts or stop at the foot of the mountains. The Vosges and Jura Mountains and the Alps are on the eastern border. Since 1860, with the annexation of Savoy, the northern slopes of Mont Blanc, the highest and most beautiful mountain in Europe, are in French territory. The passes of Mont Cenis and Mont Genèvre lead into Italy, as does also the famous Mont Cenis tunnel. The largest rivers are the Loire, 670 miles long, the Garonne (346), Dordogne (305), the Seine (485), and the Rhone (507). The island of Corsica is the only large island on the French coast belonging to France.

Political Divisions—Cities. France is divided into eighty-seven provinces or departments. The principal cities are Paris (2,888,110); Lyons (523,796); Marseilles (550,619); Bordeaux (261,678); Lille (217,804); Toulouse (149,576); Nantes (170,535); St. Etienne (148,656); Le Havre (136,159); and Rouen (124,987).

History. The earliest historian of France was Julius Cæsar, who invaded and conquered it in 58 B. C. It was then called Gaul, and the people were mainly Celts. It covered not only France, but Belgium and parts of Switzerland and Germany. At the time of Cæsar's invasion the Gauls had towns and fortifications, knew the arts of embroidery and working metals, and had made improvements in agricultural implements; but they were a rough, savage people, their females slaves, their prisoners barbarously treated and their religion idolatry, with the sacrifice of human victims. After Gaul became a part of the Roman empire, it was gradually civilized and in the second century A. D. it was the most populous of the Roman provinces. The Roman power yielded to that of the Franks, a Germanic tribe, under Clovis in 481. Paris was his capital. This first dynasty was called the Merovingian. Under Charlemagne, the second ruler of the second dynasty, called Carlovingian, which began in 751, France was raised to a high position in western Europe. The real founder of the French monarchy, as distinct from the Frankish kingdom of Charlemagne, was Hugh Capet, count of Paris and Orleans, who was made king by the feudal chiefs in 987. The Norsemen, however, had already seized what now is Normandy, and in the 12th and 13th centuries their Anglo-Norman descendants owned far the greater part of France. For many years the kings of England laid claim to the crown of France. Hence the enmity between the two countries; the crusades and the Crimean war being the only instances of a military union between them. Normandy, Maine, Touraine and Poitou were taken back from France (1180–1223). With Philip VI (1328–50) came the house of Valois, which succeeded to the throne by the Salic law, which had come down from the Franks and excluded women from royal power. From 1339 to 1422 France suffered from the long though intermittent struggle with England, in which took place the battles of Crécy (1346), Poitiers (1356) and Agincourt (1415). Louis XII, the Father of His People, and Francis I wasted the resources of the country in fruitless efforts to establish their claims on Lombardy. Francis I in his wars with Charles V secured Burgundy (1544), and Henry II recovered Calais. Under Francis II the Catholic house of Guise became powerful; while the reform movement was headed by their opponents, the house of Bourbon. The massacre of St. Bartholomew (1572) under Charles IX did much to weaken France.

Henry IV of Navarre (1589–1610), the first of the Bourbon princes, was succeeded by Louis XIII, who, influenced by Richelieu, sided with the Protestant princes in the Thirty Years' War, and he by Louis XIV (1643–1715), in whose reign the French monarchy reached its highest point of luxury and power. He extended the borders of France to the Rhine, and art, literature and science flourished to a degree unknown before; but the revocation of the edict of Nantes (1598) sent 400,000 of its best citizens from France. In the reign of Louis XV Corsica was added to France, but by the peace of Paris (1763) the larger part of the French colonies was yielded to England. Louis XVI, a well-meaning but weak prince, succeeded to a weakened throne. The spirit of the time, the success of the American War of Independence, the sufferings of the people and the oppressions of the nobles all united in the Revolution which broke out in 1789. In January, 1793, the king was beheaded; a reaction set in; and the people, wearied of bloodshed, were anxious for peace, and a general amnesty was declared in 1795. The state was governed by three consuls, Napoleon Bonaparte being the first, after the directory, to fill that office. At the head of the French army he gained the battle of Marengo. By the peace of Lunéville the boundaries of France were once more extended to the Rhine. In 1804 Napoleon was declared emperor by the vote of the people. In his victorious career he made himself king of Italy, made Holland and Naples vassal kingdoms, set up in Germany the Confederation of the Rhine, conquered Prussia, occupied Portugal, deposed the Bourbons in Spain, made Rome a French town and carried off the pope to Fontainebleau. With 1811 came a turning point in his fortunes; he was defeated in 1814; Paris capitulated to the allies and Napoleon retired to Elba. Louis XVIII (1814–24) succeeded to the throne, his reign being soon interrupted by the return of Napoleon, who met his final defeat at Waterloo. Charles X and Louis Philippe end the long line of French kings, the Revolution of 1848 overthrowing the latter. Louis Napoleon was in 1848 elected president of the new republic, but assumed the powers of a dictator by the *coup d'état* of December, 1851, and a year later, by a vote of the people, became emperor as Napoleon III, reigning nearly twenty years. The Franco-German War (1870–71) was begun by him as a vent for the growing discontent of the people; but the French army lost battle after battle, until at Sedan the emperor, with 83,000 men, surrendered to Prussia. France, after the treaty by which she lost Alsace and a part of Lorraine, again became a republic, the first president being M. Thiers (*q. v.*) who had opposed the war with Germany. She has since been successfully endeavoring to restore the prosperity of the people and make up for the ravages of war. The colonial possessions of France include, besides those in Africa—Algeria, Tunis, Senegal, French Sudan, Dahomé, French Congo, Madagascar and Réunion—a few possessions in India, in Indo-China (including Tonking, Anam, Cochin-China and Cambodia), French Guiana, New Caledonia and several islands in the West Indies, the Pacific and those off Newfoundland. See *French and English* by Hamerton; *French Revolution* by Carlyle; *History of the Girondists* by Lamartine; and *History of France* (for young people) by Charlotte M. Yonge. See, also, FRENCH LANGUAGE and LITERATURE.

Natural Resources. Owing to its long coast-line of 1,760 miles the fisheries are of great importance. The country is deficient in minerals; iron and coal are imported in large quantities, though it has excellent quarries of stone.

Agriculture. Three fourths of the people live in the country and one fourth in the cities. Half of the people live by agriculture. The products are wheat, oats, rye, barley, buckwheat and corn; beetroots grown for sugar cover half a million acres; while market-gardening has been carried to great perfection, reaching often from $300 to $900 an acre in the value of the crop. Cattle-breeding, raising horses and mules and sheep-rearing are large industries.

Manufactures. In manufactures France is progressing rapidly. It has nearly 150,000 factories, employing 2,000,000 people. France holds the first rank in silk-manufacture; and is about equal to Germany in the manufacture of cotton-goods, though below Great Britain and the United States. All industries connected with furniture, dress and articles of luxury are active, and show the artistic taste for which the people are noted. Valenciennes, Chantilly and Alençon laces, Sèvres and Limoges porcelain and Aubusson carpets are examples of the productions of this class, while in the manufacture of jewelry few places in the world can rival Paris. It also is the greatest book-market in the world.

Revenues and Commerce. The revenues of France in 1911 were 4,386 million francs, and its expenditures nearly equalled this sum. Commerce is carried on by 15,878 sailing-vessels of 638,265 tons, with crews of 72,968 men; there also are 1,670 steamers of 806,073 tons and crews numbering 16,558. Much internal commerce is conducted *via* the rivers, canals and railways. These canals connect the natural waterways and thus establish easy communication through the interior as well as between the Atlantic and the Mediterranean. There are 30,709 miles of railway and 113,332 of telegraph lines.

Government. The present government is republican. There are a president, elected for seven years, and two houses, the chamber of deputies with 584 members and the senate, which consists of 300 members, of whom seventy-five hold their seats for life. There are eleven ministers, corresponding to the cabinet-officers of the United States. There are three courts, the civil, criminal and supreme court, the latter called the court of cassation. The unit of the local government is the commune, most of these having less than 1,500 inhabitants. The army in time of peace has 629,500 men, and in time of war, with the active army, a garrison-force and reserves, it comprises nearly two and a half millions of men. Every young man serves, from 20 to 45, either in the active army or in the reserves. The navy, second only to that of Great Britain, consists of 515 vessels, including battleships, armored cruisers, torpedo-boats, submarines, etc., besides those building or completing, about 36 in number. Cherbourg, Brest, Toulon, Rochefort and L'Orient are fortified naval ports. The population of France is 39,601,509, of whom 1,126,531 are foreigners. The annual increase of population is slower than in the other chief countries of Europe, owing to the small number of marriages and the small number of children in a family. In 1907 the death-rate was greater than the birth-rate. The French emigrate only in small numbers, and the French colonies have never brought any large revenue to the state. There are, it is estimated, 125,000 French immigrants in the United States.

Education. This is free, and provided by common schools, classical and scientific schools, colleges and universities. Free public instruction commences with infant-schools attended by children from 2 to 6 years of age. Then follow the primary schools, which all children between 6 and 13 are obliged to attend. Next come the superior primary schools; then the *Lycées*, the latter two being maintained separately for the sexes.

The record for one year estimates the annual cost of maintaining these institutions as, for boy's *Lycées* 16 million francs for girl's *Lycées* 3½ million francs. Among other higher institutions of learning maintained by public funds are the College of France and the Museum of Natural History. In Paris is the famous University of Paris, which as early as the 16th century had 12,000 students and now has 15,000 to 18,000 in attendance. There is a naval school at Brest, and there are many schools providing professional and technical education.

Francesca, Piero della (*pē-ā′rō dăl′lȧ frȧn-chăs′kȧ*), an Italian painter, was born in 1398, and died in 1484. Some fine pictures of his exist still, but his early ones perished, and Raphael painted out his frescoes in the Vatican. His fame comes chiefly from his being the first Italian artist to formulate the principles of linear perspective, study the anatomy of the nude and employ lay figures. He modeled these in clay, and draped them with costumes folded wet. He lost his sight at 60, and devoted himself to mathematics.

Francis I of France, was born at Cognac, France, on Sept. 12, 1494, and became king on Jan. 1, 1515. His first act was to reconquer Milan. Charles V, Henry VIII and the pope were in alliance against him, driving his troops out of Italy and invading France on the north. Taken prisoner at the battle of Pavia (1525), Francis was kept a year at Madrid, gaining his freedom only by renouncing Flanders, Artois, the duchy of Burgundy and all his Italian possessions. His struggles with Charles V continued until the peace of Crécy or Cressy, 1744. His reign is marked by the Renaissance (the new birth of learning), the beginning of the Protestant Reformation and the strengthening of the power of the monarchy. He fostered learning and art, invited painters and scholars to his kingdom, founded libraries, opened schools and built several of the finest palaces in France; but his persecution of the Vaudois has left a stain on his memory. He died March 31, 1547. See *Court and Reign of Francis I* by Pardoe and *Francis I and His Times* by Corgriet.

Francis II of Germany and I of Austria, was born at Florence, Italy, on Feb. 12, 1768, and succeeded his father, Leopold II, in 1792. His reign was a series of wars against Napoleon, in which, with the exception of the last, he was beaten. In 1806 he formally abdicated the crown of the Holy Roman Empire and made Austria an empire, himself becoming its first emperor. Although narrow-minded, Francis was a popular ruler. He died at Vienna on March 2. 1835.

Francis d' Assisi (*ȧs-sē′zē*), founder of the Franciscan order and a saint of the Roman Catholic church, was born in 1182. In his early years he was remarkable for his love of gayety; but sickness turned his thoughts from earth, and he at once commenced the practice of the strictest forms of religious discipline. He submitted to humiliations without number. By 1210 he had 11 followers, and he then drew up a set of rules for their guidance. The order was approved by Pope Innocent III in 1210, and in 1212 the Church of Santa Maria degli Angeli was assigned as their home. At the first general assembly, held in 1219, 5,000 members were present. From the sultan of Egypt Francis obtained for his order the guardianship of the Church of the Holy Sepulcher, which it still retains. Francis died at Assisi, on Oct. 4, 1226, and was canonized by Gregory IX in 1228. See Mrs. Oliphant's *Francis d' Assisi* and Sabatier's life of him.

Francis Joseph, emperor of Austria, was born at Vienna, on Aug. 18, 1830, and ascended the throne in 1848. He was crowned King of Hungary in 1867. His first task was to subdue the Hungarian revolt and pacify Lombardy. After this was accomplished a reaction set in. Lombardy was ceded to Sardinia; and by the war with Prussia in 1866 Austria was excluded from Germany. The emperor then adopted a policy of conciliation, and the now aged monarch reigns at present the most peaceful of European sovereigns. By the death of his only son,

FRANCIS JOSEPH I

Rudolf, the crown passes to Francis Ferdinand, son of the emperor's brother, Charles Louis, who renounced his claims to the throne.

Francis Xavier. See XAVIER.

Francis'cans, also called **Minorites** or **Lesser Brethren,** a religious order of the Roman Catholic church, founded by Francis d'Assisi in 1210. The head of the order is called the general and lives in Rome. It is the parent of many religious institutions, the earliest being Observantists, known for their more strict observance of the rules; the Conventuals are the less rigid party. Another offshoot is the Capuchins, founded in the 16th century. There also are several orders of nuns in the Franciscan institute, the Little Clares, Capuchins and Urbanists being well-known. As a literary order they have been eminent in the theological sciences. The order supplied the papal throne with Nicholas IV, Alexander V, Sixtus IV, Sixtus V and Clement XIV. See Jessopp's *The Coming of the Friars.*

Franco-German War (1870–71). The ostensible cause of this war, which proved so disastrous to France, was the offer, after the deposition and expulsion of Queen Isabella II, of the Spanish crown to Prince Hohenzollern, a relative of the king of Prussia. This France deemed an insult and peril to her. Though the prince declined the offer, France, by her distrust of Germany and racial hatred of the Teuton, made it the pretext of war. This occurred in July, 1870, and a conflict of great magnitude between France and Germany ensued. From the outset the war was disastrous to France, which was able to put, altogether, not more than 250,000 in the field against 450,000 Germans, with the most efficient equipment and unequaled generalship. The conflict began early in August with the crossing of the German frontier by a French division, 30,000 strong, which attacked the little town of Saarbrück, defended by a small force of Uhlans who were compelled to retire. At this affair there were present Napoleon and his son, the prince imperial, who, it was heralded by the emperor, here received his "baptism of fire." Two days later occurred the affair at Weissenburg, where the German crown-prince (afterward Emperor Frederick) fell upon the right wing of the French army under MacMahon, and on Aug. 6 attacked and routed the French at Wörth. On the same day the Germans, under Steinmetz, gained another decisive victory at Spicheren, which was followed shortly afterward by a further success at Courcelles, over Marshal Bazaine, who was driven into Metz and there besieged by a German division under Prince Frederick Charles. Just before the investment of this, the capital of Lorraine, occurred the battle of Vionville and the murderous one at Gravelotte (Aug. 14–18), seven miles west of Metz, where some 35,000 men of both sides were placed *hors de combat.* These disasters to France only increased the hatred of the French people to the German nation, and roused the national spirit to a state bordering on frenzy. The Germans, on the other hand, with invincible courage and aided by the strategy of Field-marshal Von Moltke, lost no time in following their successes by others equally gratifying to their science and skill in war. At the end of August the French were once more defeated, this time in the battle of Beaumont, which compelled MacMahon to abandon the attempted relief of Bazaine at Metz, to fall back with the French emperor, and to shut himself and his army of 80,000 within Sedan, only to capitulate on the first day of September. When news of the surrender and the capture of the French emperor reached Paris, the tumult in the capital led Empress Eugènie to take flight, when the third republic was proclaimed and the empire collapsed. This was followed (Sept. 19) by the investment and siege of Paris by the Germans and, a week later, by the surrender of Strassburg and 18,000 French, and a month afterward by the surrender of Metz (Oct. 27), its fortress and 173,000 men. Various other victories fell to the Germans during the remainder of the year, and Paris capitulated, after a number of bloody sorties, Jan. 28, 1871. The end came with French overtures for peace, adopted at Versailles (Feb. 26), which were ratified, May 10, 1871, by a definitive treaty between the two nations at Frankfort-on-the-Main.

Franco'nia Mountains. See WHITE MOUNTAINS.

Frank'fort, the capital of Kentucky, is situated on the Kentucky River, 29 miles northwest of Lexington. It is noted for its beautiful scenery, has well-paved streets and several parks. Frankfort has an admirable public-school system, and other educational institutions are a young ladies' seminary and a military school. It contains the state-house, the state-library, the penitentiary and a beautiful cemetery. It has a large lumber-trade, and manufactures lumber-products, twine, pottery etc. Frankfort has the service of three railroads and a population of10,465.

Frankfort-on-the-Main, a city of Prussia, once a free city, is situated on the right bank of the Main, 22 miles from its junction with the Rhine at Mainz. There are seven bridges across the Main at Frankfort, one of them built in 1342. The city has been extended and improved, the fortifications being replaced by ornamental promenades and the river bordered by broad quays. One of the squares is adorned with a statue of Goethe, its most celebrated citizen, and the Gutenberg monument commemorates the invention of printing. The exchange, opera-house, museums, art-galleries, public library, two conservatories of music and the central station, one of the largest and handsomest railroad-stations in Europe, are among the modern buildings. Frankfort is a wealthy city, having always had a large trade in iron and steel-goods, leather, skins, coal, wine and beer, sewing machines, soap and perfumery. Its chief importance, however, is due to its being one of the money-markets in the world. It was the home of the Rothschilds, and their ancestral house is now the sole relic of the famous Jew-street of Frankfort. It is said to owe its name to Charlemagne, who here led his Franks across a ford of the river Main; and from 843 to 889 it was the capital of his kingdom. It was the first free city of the German empire, and the most important. It was long famous as the place of the election of the German emperors, and the town-house contains the imperial hall where each newly elected emperor held a public banquet. The coronation took place in the Cathedral of St. Bartholomew, which also contains the chapel in which the electors voted. The North German *Diet* met at Frankfort from 1816 to 1866. Frankfort became Protestant in 1530; lost its independence in the Confederation of the Rhine; became free again in 1816; but in 1866 was taken by Prussia. The peace of Frankfort, which ended the Franco-German War, was signed here in May, 1871. Population 414,598.

Frank'incense, a name used to designate fragrant, resinous substances, which give off a strong odor in burning and are used in religious services. That of the Jews and ancient Greeks and Romans is known as *olibanum.* The natural gum of several kinds of trees, as the fir, is the common frankincense.

Frank'lin, a town of Williamson County, Tenn., is situated 18 miles south of Nashville on the L. and N. Railroad. Franklin has planing and flour-mills, carriage-factories and several steam cotton-gins. It has public schools, and here are located Tennessee Female College, established in 1856; Harpeth Male Academy and a Masonic Temple. Population 2,924. An important battle was fought here on Nov. 30, 1864, between the Union forces under General J. M. Schofield and the Confederate troops under General J. B. Hood. After a hard-fought battle, General Hood was repulsed with a loss of 6,000 men, while the Union army lost 2,300 men.

Franklin, a term frequently found in English literature. It means a freeholder or substantial householder of the middle class. The word comes from the late Latin word *Francus,* meaning free. It is used by some of the older English writers to mean a host who voyage in 1845 in search of the northwest passage is memorable.

BENJAMIN FRANKLIN

Franklin, Benjamin. There is something perennial about the spirit of this great American patriot of civil life, philosopher, statesman, diplomat and writer. Though born in the infancy of science (on Jan. 17, 1706), and dying (on April 17, 1790) in the infancy of the republic he had helped establish, he projects himself into the interests and problems of to-day and of all times as does no other man who figures in American history. His many-sided genius, sublimated common-sense, practical citizenship, hospitality to new ideas and ideals and his moral courage make him a character to whom men of any age must have turned with confidence and hope. There is nothing in Franklin's ancestry or environment to account for him. In the family-history for four centuries behind him there had not been one man who rose above mediocrity, or one who fell below respectability. The Franklins were small landed-proprietors or tradesmen in Northamptonshire, England; simple, industrious, pious. The father emigrated to Boston in 1682, and set up in business as a candle-molder and soap-boiler. His tenth child was taken to the Old South Church, christened Benjamin, and dedicated to the ministry. Lack of money for the necessary education forced the boy to learn the printer's trade. Disputatious, sarcastic, vain, resenting control and given to expressing unpopular opinions, the boy got into disrepute in the strict Puritan town. So, at 17, he ran away to Philadelphia. He landed with a silver dollar. a trade, plenty of self-confidence and a suddenly-formed resolution to turn over a new leaf, thus showing remarkable strength of character. Ever afterward he was noted for his suavity, avoidance of controversy and patience.

At 23 he owned his own printing-office and was publishing the *Pennsylvania Gazette,* which, is it claimed, survives to-day in *The Saturday Evening Post.* For the next 20 years he was the foremost journalist in the colonies. *Poor Richard's Almanac,* issued annually for a quarter of a century, made him known from city mansion to the remotest frontier-cabin. While making fame and fortune as a printer, publisher and writer, he was studying foreign languages and literatures, experimenting in science and taking a conspicuous part in local affairs. From 1730, when he was chosen clerk of the Pennsylvania General Assembly, until 1786, when he returned from Paris at the close of the American Revolution, he was almost continually in the public service, and this without compensation. Big and little things alike claimed attention. Now he was organizing a police or fire-department or local militia; now putting a street-lamp before his gate and paving his sidewalk to arouse public spirit; building an Academy of Science; a church free for all denominations; collecting books for the first free circulating library; organizing a system of colonial defense against the Indian; inventing rockers for his easy-chair and a portable fireplace, called the Franklin stove, and refusing to take out patents. He always declared that as we are indebted to the ingenuity of men in the past, so it is only a duty to give our own contrivances to the present and future.

After 1760 (his 54th year) Franklin spent a quarter of a century abroad in the service of his country. His discovery of the identity of lightning and electricity had long before made him the best-known American in Europe. Learned societies and universities welcomed him, and he soon won equal distinction as a diplomat. Ten years he spent in London. He got the stamp-act repealed. An eminent English statesman declares to-day that had the king and Parliament accepted Franklin's just contention that the American colonies were self-governing, owing allegiance only to the sovereign, the Revolutionary War might never have been fought. Franklin, after a decade of working in vain for peace with honor and justice, returned to help frame the Declaration of Independence, to place $20,000 of his fortune at the service of Congress, and then cross the sea to win the help of France in the cause of American liberty. His position in Paris, although he represented poor, rebel colonies whose success seemed unlikely, was extraordinarily influential, unprecedented and never again equalled in the history of diplomacy. Camp and court and the world of science were at his feet. Never before had Europe seen a man at once so wise and witty, so urbane and with such upsetting ideas of the equality of men and of the duties of rulers. His simple dress became the fashion; his benign face adorned ornaments of cameo; his portrait was in college, palace and cottage. He was the first great plebeian standing upright before kings, and he fired the imagination of the people. This is believed to have had its influence in hastening the French Revolution.

It is flattering to our pride to learn that the mind, character and versatile genius of Franklin have been called an epitome of all that is best in the typical American. He won as the best among us win,—by straightforwardness. He introduced "shirt-sleeve" diplomacy into Europe; he had shrewdness, good nature, open-mindedness, persistence and infinite knowledge of the world and of human nature.

When Franklin returned to America, he was in his 86th year and begged for rest; but he became chairman of the municipal council, a member of the constitutional convention that drafted the constitution; and he organized the postal service, travelling in a carriage through every state. Conquered at last by the infirmities of age, he continued to give scientific discoveries to the world. His last public act was to affix his signature to a memorial to the state legislature, as president of the Pennsylvania Abolition Society. Abolition in 1790 brings Franklin into touch with Lincoln three quarters of a century later. He seems equally in touch with wireless telegraphy, aerial navigation, the currency and other questions of to-day. No life of him is comparable to his own autobiography. As literature it is a classic, and as a human document it is unsurpassed in its illuminating candor.

Franklin, Admiral Sir John. To the man who perishes in a brave cause the world pays peculiar honor, and when his death is obscure and lonely and his grave unmarked, it adds tender regret. This heroic Arctic explorer is one of the few whose memory is so enshrined in the hearts of men. To hear his story is to be, not saddened by his fate, but uplifted because such a man, and one of our own Saxon blood, has lived and shown how a devoted man may die.

It is not improbable that the British admiral sprang from the same north-of-England stock as our own Benjamin Franklin. He was born on April 16, 1786, in Lincolnshire, a county that adjoins Northamptonshire, whence Benjamin Franklin's father had emigrated a hundred years before. The name is old Saxon for free-holder, and the ancestors of both were small landed-proprietors or tradesmen—thrifty, industrious, pious, unremarkable. At 14 John Franklin was on the quarter-deck of a naval vessel; at 15 in the battle of Copenhagen where Nelson won his first laurels. Two months later the boy sailed with an expedition to explore and map the coast of Australia, then almost unknown. Here he acquired skill in surveying, deep-sea sounding and astronomical observation that fitted him for his work as a scientific explorer. Adventure marked the gallant boy for its own. He was wrecked on a coral island; he was signal officer on the *Bellerophon* at Trafalgar; he commanded a vessel at the battle of New Orleans; at 32 he was a minor officer in a polar expedition. At 41, with the rank of captain, he commanded an expedition to map Mackenzie River. Honors crowded thick and fast upon him—a knighthood and then, for seven years, the governorship of Tasmania. In May, 1845, as an admiral, he sailed again, with the *Erebus* and *Terror*, to discover the northwest passage. Calmness in time of danger, resourcefulness, the highest order of seamanship, a sanguine temperament, the capacity for inspiring trust and loyalty in the men of his command and scientific ardor had long marked Sir John as the one man in England most likely to succeed in so hazardous an undertaking where so many had failed.

He discovered the northwest passage, but at so terrible a cost that the 20th century was six years old before anyone ventured to force a way through it. (See AMUNDSEN, ROALD).

The *Erebus* and *Terror* were last hailed by whalers in Baffin's Bay in July of 1845. Franklin died on King William's Island, Boothia, at the eastern end of the passage that had been sought since the days of Sebastian Cabot, in June of 1847. The survivors all perished in the attempt to reach the main land. Details of the disaster were recovered piecemeal, along with relics from the abandoned ships, from Esquimaux and from a packet of buried papers. Fifteen expeditions were fitted out first to relieve, then to find trace of, the lost explorers. Two of these were led by Dr. Elisha Kent Kane, the American scientist. It was not until 1857 that the yacht *Fox*, sent out by Lady Franklin, brought back the story of Franklin's tragic end. His resting place in that vast tomb of ice has never been located, for the ships vanished. Lady Franklin spent her entire fortune and 15 years in efforts to recover his body. The monument raised in Westminster Abbey pays tribute to her as well as to her hero. For the cenotaph Tennyson, the laureate, wrote these words:

"Not here! The white north holds thy bones; and thou,
Heroic sailor-soul,
Art sailing on another voyage now,
Toward no earthly pole."

See *Life* by Beesly.

Franklin, William Buel, American general, was born at York, Pa., on Feb. 27, 1823, and graduated at West Point in 1843. Early in his career he served in the War with Mexico, and on the outbreak of the Civil War he was appointed colonel of the 12th infantry, subsequently rising to the rank of major-general. He commanded the sixth corps through the peninsular campaign, fought at South Mountain and Antietam, and was in command of the left grand division of the United States army at Fredericksburg at the close of 1862. In 1864 he was given command of the 19th army corps, which took part in the Red River expedition, but was wounded and obliged to retire from active service. After the war he became vice-president of the Colt Firearms Company at Hartford, Conn. In 1880 he was president of the board of managers of the National Soldiers' Home, and in 1889 was United States commissioner to the Paris exposition of that year, which won him the insignia of grand officer of the Legion of Honor from the French government. He died on March 8, 1903.

GEN. WILLIAM B. FRANKLIN

Franks, a name applied in the 3d century to a number of German tribes living on the middle and the lower Rhine. They were a stalwart race of warriors, distinguished by long hair, blue eyes and largeness of limb. They lived in villages, and had gardens and vineyards. To the Salian Franks is due the celebrated Salic law.

Franz, Robert (1815–1892), was one of the most important of German song-writers, ranking with Schubert and Schumann in consummate artistry. Besides 257 songs for single voice, he composed sacred and secular choral works and made masterly arrangements of Bach, Handel and other great composers.

Fra'ser, Hon. Duncan C., was born in Nova Scotia, and graduated from Dalhousie University. He held important public positions in his own province; was first elected to the Canadian House of Commons in 1891; and was appointed a judge of the supreme court of Nova Scotia in 1904. He was appointed lieutenant-governor of Nova Scotia in 1906. An able platform-speaker, he is an ardent free-trader.

Fraser, William A., was born in Nova Scotia in 1859. By profession at first a mining engineer, he became a frequent contributor to magazines, devoting himself especially to animal stories. Among his books are *The Outcast*, *Thirteen Men*, *Thoroughbreds*, *Mooswa* and *The Lone Furrow*.

Fraser (*frā'ser*) **River,** the principal stream of British Columbia, is formed by two branches, the more important of which rises in the Rocky Mountains. The river is 800 miles long, and flows into the Georgian Gulf. Salmon-fishing is one of the great industries along its banks. Steamboats can navigate it for 100 miles, when the river passes by a series of swirling rapids through the Cascade Range, the grand cañon of the Fraser.

Fraunhofer (*froun'hō-fĕr*), **Joseph,** a German optician and physicist, was born near Munich on March 6, 1787, and died there on June 7, 1826. His early training was that of a glass-polisher, being apprenticed at the age of twelve. His chief accomplishments, perhaps, are the invention of the diffraction-grating (See DIFFRACTION-GRATING); the discovery of the dark absorption lines in the solar spectrum, now known as Fraunhofer's lines; the discovery that the stars have spectra of the same general type as the sun but different from that of the sun; and a general discussion of the phenomena of diffraction.

His most important papers have been edited and reprinted by Professor Ames in Harper's *Scientific Memoirs.*

Frechette (*frȧ'shĕt'*), **Louis,** LL. D., president of the Royal Society of Canada and member of numerous literary and learned societies, was born at Levis, Quebec, on Nov. 16, 1839. He was educated at Laval University and Nicolet College, was called to the bar in 1864, afterward removing to Chicago and living there until the great fire of 1871. He divided his attention between law and editing *Le Journal* of Quebec and *La Patrie* of Montreal, representing Levis in Parliament in 1874, until in 1889 he became clerk of the legislative council of the province of Quebec. His publications are numerous and met with appreciation. In addition he made translations in French of the works of Howells and Cable and of several dramas and comedies. He died on May 31, 1908.

Fred'erick I, called Barbarossa or Red-Beard, was born about 1123, and became emperor of Germany in 1152. His reign was a long struggle with powerful vassals at home and with Lombardy and the pope in Italy. He captured Milan in 1162, and took Rome by storm five years later. His army was, however, smitten with the plague, and Lombardy again revolted; and in 1176 he was defeated at Legnano. At home he managed his vassals by conciliation and by keeping the balance of power among them equal. He asserted his power, moreover, over Poland, Hungary, Denmark and Burgundy. At the height of his fame and influence he took the cross to fight against Saladin. He defeated the Mohammedans in two battles, but was himself drowned in Pisidia on June 10, 1190. The legends and songs of Germany still cling about the memory of Frederick Barbarossa.

Frederick III, second German emperor and eighth king of Prussia, was born at Potsdam, Oct. 18, 1831, and was in early life educated to the profession of arms. After leaving Bonn University he studied the art of war under Moltke. In January, 1858, he married the princess-royal of England. He took a prominent part in the War with Austria and in the Franco Prussian War; for his services in the latter campaign he was made a field-marshal. In 1887 he showed signs of suffering from a throat trouble, and was operated upon in February, 1888, without success. On the 9th of March Emperor William I died, and Frederick ascended the throne as Frederick III. His throat continued to trouble him, and, despite all that medical science could do for him, he died on June 15, 1888.

FREDERICK III

Frederick I, king of Prussia and third elector of Brandenburg of that name, was born at Königsberg, July 11, 1657. He succeeded to the electorate in 1688, and on Jan. 18, 1701, elevated himself to the dignity of a king. He gave valuable support to William of Orange in his attempt on England, and characterized his reign by advancing the arts and sciences. Frederick died on Feb. 25, 1713, and was succeeded by his son, Frederick William I.

Frederick II of Prussia, better known as Frederick the Great was born at Berlin, Jan. 24, 1712. His early education was directed by military men, and its narrowness forced him into frequent open rebellion. When but eighteen he attempted to escape to England, but was unsuccessful; his father looked upon this act as military insubordination and political rebellion, and punished him with close confinement at Küstrin, where he remained until 1733, when, shortly after his liberation, he married Princess Elizabeth Christina of Brunswick. Until 1740 he devoted his leisure time to the study of music and French literature, and then began to manifest signs of political ambition. On May 31 of that year he became king, and in the following December entered into a war with Austria, putting forward as a reason an old claim upon the province of Silesia. He twice defeated the Austrians, and by the treaty of Breslau, June, 1742, was awarded Upper and Lower Silesia. He again added to his territories as the result of a second Silesian War (August, 1744, to December, 1745), and after eleven years of peace he began a Silesian campaign (1756), better known as the Seven Years' War. In 1772 he added Polish Prussia and a large part of Great Poland to the Prussian crown. He died at Potsdam, Aug. 17, 1786. His military achievements gave him fame as a great military leader, whence his title of Frederick the Great, but he also was first in peace and greatly benefitted Prussia within. See Carlyle's *History of Frederick II.*

Frederick Charles, a Prussian prince known as the Red Prince from the color of his favorite hussar-uniform, was born at Berlin, March 20, 1828. He was educated for the army, and saw service in the Schleswig-Holstein War and in the second Danish War; while in the Austrian War he won the great victory of Königgratz. In the Franco-Prussian War he commanded the second army, drove Bazaine back to Metz, and compelled that fortress to surrender on Oct. 27, 1870. He was one of the ablest of Prussian generals. He died June 15, 1885.

Frederick William, elector of Brandenburg, commonly called the Great Elector, was born on Feb. 16, 1620, succeeded to the electorate in 1640, and died on April 29, 1688. On his accession, he found an empty treasury and general devastation on account of the Thirty Years' War. He instituted a policy of peace, and devoted himself to consolidating his dominions; and when he died, he left a well-filled treasury and a highly-organized army. He was succeeded by his son, Frederick III, afterward King Frederick I of Prussia.

Frederick William I, king of Prussia, was born at Berlin, Aug. 15, 1688. The greater part of his reign (1713–40) was devoted to the improving of Prussia's internal condition, and the result of his policy was seen at his death, which occurred on May 31, 1740, when he left to his son a treasure of $6,750,000 and an army of 80,000 men, at that time the best-drilled force in Europe.

Frederick William IV, king of Prussia, was born Oct. 15, 1795. His reign (1840–61) was one long struggle of the people of Prussia against their king for a constitutional form of government. At length, on Jan. 31, 1850, the country was granted a representative parliament. He died on Jan. 2, 1861, being succeeded by his brother, Emperor William I of Germany.

Frederick, Md., a city and county-seat of Frederick County, 62 miles from Baltimore. It is the scene of Whittier's poem *Barbara Frietchie*, and its importance is chiefly historical. Twice during the Civil War it was occupied by the Confederates. The second time, in 1864, General Early demanded a large ransom, which was paid. General McClellan with Federal troops occupied the city in 1862. Frederick has manufactories of leather, shoes, knit-goods, shirt-waists, tobacco etc., besides canning-factories, flour and planing-mills. Here are located the State School for Deaf and Dumb, Frederick College and the Woman's College. It is served by the Pennsylvania and Baltimore and Ohio railways. Population 10,411.

Fred'ericksburg, Battle of, was one of the great battles of the American Civil War, in which the Union forces sustained a defeat. General Burnside divided his command into three divisions, and advanced to Falmouth opposite Fredericksburg, Va. Before the head of his column had crossed the Rappahannock, Lee had fortified the heights in rear of the town, and so harassed the Union forces that it took two days to cross. On Dec. 13, 1862, Burnside moved to the attack, but was forced to retire. Next day he wished to renew the attack, but was persuaded not to do so, and on the night of the 15th, under cover of a storm, what remained of the Union army was brought back to Falmouth. Burnside lost 12,321 men, while the Confederate loss was 5,309 men. Burnside, a week later, was relieved of his command, and General Hooker was appointed to succeed him.

Fred'ericton is the capital of New Brunswick, and is situated on the right bank of St. John River, 85 miles from its mouth, at the head of navigation. Population 7,500. Its chief business is lumbering. The normal school, the Canadian School of Infantry and the Parliament-buildings of the province are located here.

Free'man, Edward Augustus, one of the most learned of English historians, was born in 1823, at Harborne, Staffordshire; and died in Spain on March 16, 1892. He studied at Trinity College, Oxford, and in 1845 became a fellow of that college. He was a master of research, as is seen in his works, some of the best known being *A History of the Saracens; History of the Norman Conquest;* and *The Ottoman Power in Europe*. During 1881-82 he traveled in the United States, and on his return to England published *Some Impressions of the United States*. With his appointment as regius professor of modern history at Oxford, Freeman's industry was greatly whetted, and he became a voluminous writer. Besides his historical works, he wrote largely on antiquarian and topographical subjects as well as on architecture, and on comparative politics. He also published useful textbooks of historical nature, as *Old English History; General Sketch of European History; Historical Essays; History of Sicily; Methods of Historical Study; Historical Geography of Europe William the Conqueror*, and *Sicily: Phœnician, Greek and Roman*.

Freeman, Mary Eleanor Wilkins, American authoress, was born at Randolph, Mass., in 1862, and in 1902 married Charles Freeman. She has written largely on New England life. Her chief works, besides poems, short stories etc., contributed to magazines, embrace *Jane Field; A New England Nun; Giles Corey, Yeoman; Young Lucretia; The Wind in the Rosebush; The Givers;* and *By the Light of her Soul*.

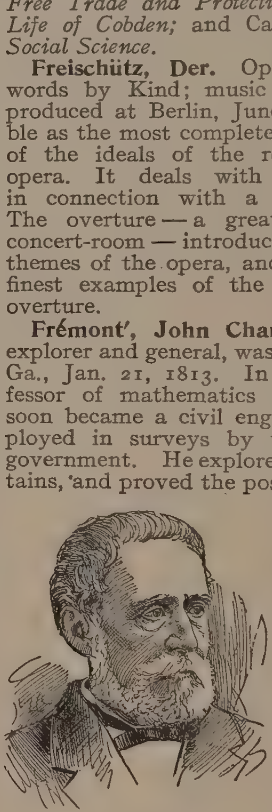
Free′masons are members of a secret society, the origin of which has by tradition been variously traced back to the Knights Templars, the old Roman empire, the Pharaohs, Hiram of Tyre, the Temple of Solomon or even to the times of the Tower of Babel and of the Ark of Noah. In reality the craft sprang into being from the same causes and reasons as other incorporated crafts. Their vocation as hewers and setters of stone compelled masons to travel from place to place in search of work. In order that they might be accepted as skilled workmen by their brother craftsmen, without the necessity of showing their skill, they made use of signs and words which they kept secret. Scotland possesses the earliest record of the presence of masons in lodges, tracing their origin to the foreign masons who came to Scotland in the 12th century to build the abbeys of Holyrood, Kilwinning and Melrose. The masons of England date back to 926, when King Athelstan held a meeting of masons at York. Modern freemasonry was introduced into America in 1730, into France in 1725, Russia in 1731 and Germany in 1740. There are over 48 grand lodges, exercising control over nearly 10,000 lodges in the United States, and nowhere is masonry held in greater honor or importance. The total membership in the lodges of the United States and British America for 1907 was 1,188,566. A set of passwords and a peculiar grip of the hand enable the initiated to recognize each other A great benefit derived from membership in the order is that it enables a mason where he is a stranger to make himself known to his brother-masons and claim their protection. See J. Fellowes' *Mysteries of Freemasonry.*

Free′port, the county-seat of Stephenson County, Ill., is situated on Pecatonica River, a branch of Rock River. It is 120 miles west of Chicago, on the main line of the Illinois Central railroad, and has the service of three other roads. There are various manufactures, as automobiles, buggies, shoes etc., among them the largest windmill-factory in the world. It has a large number of churches; and eight schools, employing 75 teachers, enrolling 2,600 pupils and instructing in manual training and domestic science; five weekly papers; and two banks. Population 17,567.

Free Trade is the name applied to a certain policy of a government in regard to foreign trade. Its main feature is that no duties are placed on imported foreign products. The opposite theory is protection, and its supporters believe that a nation grows and gains wealth faster by taxing imports and so "protecting" its own manufactures and other products. England has for years been the leading free-trade country, having become such under the leadership of Richard Cobden; while a Scotchman, Adam Smith, the apostle of free trade, has done more than any other to promote the belief in free trade by his famous book, *The Wealth of Nations.* The United States, France and Germany are the foremost protection countries, and France is the most highly protected nation in the world. At the present time the idea of protection seems to be gaining ground throughout the world, though in the United States there have not only always been many free traders, but there are more who believe in it now than ever before. See PROTECTION. See, also, Adam Smith's *Wealth of Nations;* Fawcett's *Free Trade and Protection;* John Morley's *Life of Cobden;* and Carey's *Principles of Social Science.*

Freischütz, Der. Opera in three acts; words by Kind; music by Weber. First produced at Berlin, June 18, 1821. Notable as the most complete early embodiment of the ideals of the romantic school of opera. It deals with the supernatural in connection with a simple love-story. The overture — a great favorite in the concert-room — introduces the principal themes of the opera, and ranks among the finest examples of the so-called program overture.

Frémont′, John Charles, an American explorer and general, was born at Savannah, Ga., Jan. 21, 1813. In 1835 he was professor of mathematics in the navy, but soon became a civil engineer and was employed in surveys by the United States government. He explored the Rocky Mountains, and proved the possibility of an overland route to the western coast of America. The highest peak of the Wind River Mountains, 13,570 feet high which he ascended, is named after him as Frémont's Peak. He crossed the South Pass, explored Great Salt Lake and went as far as Fort Vancouver, at the mouth of the Columbia. He forced a passage in the winter over the snow-covered mountains into California, reaching Sacramento in March with his men reduced to skeletons. In the spring of 1845 he set out again to explore the country between the Mississippi and the Pacific. This journey probably gave California to the Union, as he found the Mexican troops marching against the settlers



JOHN C. FRÉMONT

to drive them out, and he joined with the settlers against them and defeated them. The Americans declared themselves independent, and made Frémont governor. He was sent to Congress as senator from California in 1850. He was the Republican candidate for the presidency in 1856. In the Civil War he served for two years as a major-general. He also was governor of Arizona from 1878 to 1881. He died at New York, July 13, 1890. His services as an explorer were rewarded by a gold medal from the king of Prussia, with the founder's medal of the Royal Geographical Society of London and with membership in the Geographical Society of Berlin. See *Life* by Mrs. J. C. Frémont, the brilliant daughter of the famous Senator Benton of Missouri.

Fremont, Ohio, city, county-seat of Sandusky County on Sandusky River, 30 miles east of Toledo. It is in the center of an agricultural, oil and natural-gas region. Agricultural implements, cutlery, machinery, electro-carbons, woolens, beet-sugar, doors, sashes etc., are manufactured here. The city has good public schools, business colleges, a normal school and Birchard Public Library, founded by an uncle of President Hayes. Fremont has all the equipment of a progressive city, is served by three railroads, and has steamer-connection with all important ports on Lake Erie, with which it conducts much business. The city occupies the site of a tradingpost established in 1785, and was given its present name in 1850 in honor of J. C. Frémont. Population 9,939.

French, Alice, American authoress, known also by her pen-name, Octave Thanet, was born at Andover, Mass., March 19, 1850, and educated at Abbott Academy there. She began to write about 1878, her earliest productions being short stories illustrating western and southern life, with which she is familiar. Her chief books are *Knitters in the Sun; Stories of a Western Town; The Heart of Toil;* etc.

French and Indian Wars, 1689–1763. Under this term are included the four intercolonial wars of the 17th and 18th centuries in America, known as King William's War, Queen Anne's War, King George's War and the specifically-entitled French and Indian War — all of them conflicts with the French and Indians of Canada (New France). The last of the series, however (which is coincident with the Seven Years' War in Europe), is especially characterized in the American colonies by the designation of the French and Indian War, which comprised the period between 1755 and 1763.

This grand struggle was inevitable from the conflicting character of the respective governments England had settled the eastern coast, and claimed the territory from the Atlantic to the Pacific. The French had occupied the valley of the St. Lawrence, and, exploring westward along the Great Lakes, had followed the Wabash and Illinois Rivers to the Mississippi and thence down the great valley to the Gulf. These explorations were carried on chiefly by the Jesuit missionaries, who with unflagging energy and at the greatest personal risk, pushed far into the wilderness to establish missions among the Indians. In 1673 Father Marquette, a missionary, and Joliet, a trader, together passed down the Wisconsin River to the Mississippi and thence down that river to the Arkansas. La Salle, the most indefatigable of these explorers, received from the French king a tract of land adjoining Fort Frontenac, in recognition of his services in exploring Lakes Erie and Ontario. He then pushed westward through the Great Lakes, explored the Illinois and descended the Mississippi to the Gulf. On the line of these explorations the French had, in 1750, established 60 small military and trading-posts, stretching along the lakes and down the Maumee, the Wabash, the Illinois and the Mississippi to New Orleans. They had also traversed the country to the headwaters of the Ohio. They had thus taken formal possession of this vast country, while but little had been done in the way of colonization.

Thus far no conflict had occurred, because the English had not yet pushed their way west of the Alleghanies upon disputed territory. But in 1749 a corporation called The Ohio Company received from the king a grant of land west of the Alleghanies, along the Ohio, and opened traffic with the Indians. The French promptly resented the infringement upon their claims. The governor of Canada sent 300 men into the valley, who drove off the traders. In 1753 the French built three forts at Presque Island on Lake Erie, Fort Bœuf a short distance south and Fort Venango on the Alleghany River. Governor Dinwiddie of Virginia sent George Washington, then 21, with a message to the French General St. Pierre, in command of these forts, setting forth the claim of Virginia to the territory west of the Alleghanies and remonstrating against its occupancy by the French. Washington was courteously received, but the French commander positively declined to consider the claims of Dinwiddie. In 1754 the Ohio company built a blockhouse on the present site of Pittsburg. This was soon captured by the French, who proceeded to build Fort Duquesne on the same site. Meantime a force of 600 Virginians under Colonel Fry, Washington being second in command, were on their way to the same point. While *en route* Colonel Fry died, leaving Washington in command. At Great Meadows, within 50 miles of Fort Duquesne, learning that a French force was marching against him, he built a stockade which he named Fort Necessity. Here, on the third of July, he was attacked by the French General De Villiers with a force of 1,500 French and Indians, and after a stubborn defense was compelled to surrender.

Meantime the English government made active preparation for war. In February, 1755, General Braddock arrived with two regiments of troops. To these were added a small body of militia, and with this force he marched in April through the wilderness against Fort Duquesne. On the 9th of July Braddock was met and defeated by a large force of French and Indians, himself falling mortally wounded. A second expedition under Governor Shirley, which was sent from Albany against Fort Niagara, returned without attempting to capture it. Governor Johnson of New York, in command of a militia force, marched against Crown Point. He built Fort Edward on the Hudson, and, proceeding, met and defeated a force of French and Indians under General Dieskau, who was killed. Johnson went no further, but here built a fort which he named Fort William Henry. A fourth expedition was sent by Governor Lawrence of Massachusetts to attack the French forts on the Bay of Fundy. These they captured with little resistance, and the whole country of Nova Scotia or Acadia fell into their hands. The English were here guilty of a great piece of cruelty. The country was laid waste and the inhabitants, simple French peasants who had taken no part in the war, were driven into exile at the point of the bayonet.

The events narrated cover the operations of 1755. The plan of operations for 1756 covered the same points, viz., the capture of Forts Duquesne, Niagara and Crown Point. Not one of these objects was accomplished. On the other hand the French, led by Marquis de Montcalm, a successor of Dieskau, captured Oswego. A fleet of vessels, 135 cannon and 1,500 prisoners fell into his hands. During the summer the settlements in western Pennsylvania and Virginia were ravaged by Indians, who killed and captured large numbers of settlers. They were finally defeated with great loss in a battle near the Indian town of Kittanning. In 1757 but one expedition was undertaken by the English. Lord Loudon, who had been appointed commander-in-chief of the British forces, sailed against the fortress of Louisbourg with an army of 6,000 regulars. A fleet under Admiral Holbourn, with 5,000 men, joined him at Halifax. Learning that the garrison at Louisbourg had been reinforced, Loudon sailed back to New York without firing a gun. Meanwhile Montcalm appeared before Fort William Henry with a force of 5,000 French and Indians. After a brave defense of six days the garrison under Colonel Monroe was compelled to surrender. Montcalm destroyed the fort and returned to Crown Point.

At the close of this year — the third since hostilities began — the advantage rested decidedly with the French. The English had accomplished little, and had been driven back at the points of chief importance. With the opening of 1758 the government of England made preparations for a vigorous campaign. Twenty-two thousand troops were sent from England; the colonies furnished 28,000 militia. General Abercrombie was appointed to succeed Lord Loudon as commander-in-chief, with an able corps of subordinates, including young Lord Howe, General Amherst and General James Wolfe. Expeditions were planned against Louisbourg, Ticonderoga and Duquesne. General Amherst with a force of 10,000 men captured Louisbourg on July 28, with nearly 6,000 prisoners. Cape Breton and Prince Edward Island passed under English control. The attack on Ticonderoga was conducted by General Abercrombie at the head of 15,000 men. The English were repulsed after four hours' hard fighting, with a loss of 2,000 in killed and wounded. The English fell back to Fort George. Colonel Bradstreet was sent with 3,000 men against Fort Frontenac (Kingston) on Lake Ontario. He captured the place after a siege of two days. This success proved to have an important bearing on the capture of Fort Duquesne, which was abandoned by the French and was occupied by Virginian troops under Washington on Nov. 25.

The year 1759 opened with the advantage greatly on the side of the English. Their combined forces numbered nearly 50,000 men against 7,000 on the side of the French. Three expeditions were planned, one against Niagara, a second against Ticonderoga and Crown Point and a third against Quebec. Niagara was captured by Sir William Johnson, who took the place, after severe fighting, on July 25. In the same month General Amherst, with 11,000 men, marched against Ticonderoga. On his approach the place was abandoned by the garrison, who retired to Crown Point. This place also was abandoned five days later, and was occupied by the English. Thus these important positions fell without a struggle. Wolfe commanded the expedition against Quebec, where, on Sept. 13, occurred the most desperate and the decisive battle of the war, resulting in the defeat of the French. Wolfe was killed and Montcalm, the French commander was mortally wounded at the city's gate. Four days later the city and fortress were surrendered to the English. In September, 1760, Montreal surrendered. This was the last point of importance held by the French, and with it Canada passed into the possession of Great Britain.

The war between England and France ended with the treaty of Paris in 1763. France surrendered all her possessions east of the Mississippi, except the Island of Orleans. At the same time Florida was ceded to England by Spain. The possessions of England in America were now 20 times greater than when the war began. The Indian tribes, which had been allied with the French, refused to submit to English authority. In 1763 a formidable league was formed under the leadership of Pontiac, a famous Ottawa chief. The country west of Niagara was devastated. All the British posts, excepting Detroit and Fort Pitt, were captured and the settlements blotted out. Next year a strong force was sent against the Indians, and they were reduced to submission.

French Congo, a possession of France in west-central Africa, situated between German Kamerun, Congo Free State and Lake Chad, Kanem and Wadai. The French were among the earliest explorers of the Congo region, and M. di Brazza, the Italian explorer, obtained large tracts of land from the native chiefs for France. French Congo lies on the northern bank of the Congo River, between the river and the Atlantic, including the region around Ubanghi River. Area about 680,000 square miles. Population estimated at 5,000,000. The capital, Libreville, has a population of 3,000; other towns are Loango, Franceville, Brazzaville and Fort de Possel. French Congo is divided into three colonies, under lieutenant-governors, with a general budget for the whole. The colonies are Gabun (capital Libreville); Middle Congo (capital Brazzaville); and Ubangi-Shari-Chad (capital Fort de Possel). The mineral resources embrace gold, copper and iron; while its exports (amounting in 1904 to about 14,000,000 francs) consist of rubber, ivory, various woods, palm-oil and kernels, coffee, cocoa, kola-nuts etc. There is considerable shipping-trade at Loango, but inland trade is hindered by lack of railways, though a line is projected to connect Libreville and the Congo. Brazzaville is connected with Loango by telegraph (715 miles), and another is being put up to connect with Leopoldville in Belgian Congo.

French Guinea. Lying between Portuguese Guinea on the north and Sierra Leone on the south, this French possession extends inland with a total area of 95,000 square miles and a population estimated at 1,498,000. The colony is self-supporting, the income and outgo balancing in 1907 at 5,300,000 francs. In 1905 the imports amounted to 18,924,814 francs, and the exports to 16,373,661 francs, these consisting chiefly of rubber, cattle and palm-nuts. A road has been driven from Konakry, the capital, to the Niger at Kurussa, and a railway has followed it as far as Kindia, 83 miles. There are 1,060 miles of telegraph. As elsewhere in French West Africa, governmental lay-schools are taking the place of those under the care of religious orders. French colonization began in 1685, but official occupancy by France did not occur till 1843.

French Language, The, is a development from the Latin spoken by the Romans who had conquered Gaul in the first century B. C. under Julius Cæsar. This Latin was not classical Latin, nor even the speech of the cities, but the more corrupt *patois* of the camps and rural districts. An undefined proportion of Celtic words was adopted into the rustic Latin, and thence found a path to modern French. In the fifth century, too, a Teutonic race known as the Franks overran and conquered Gaul, which had been completely Romanized. The conquerors, indeed, adopted the spoken Latin, but introduced about 400 Teutonic words. A few Greek words came into the French language from the Greek colonies at Marseilles and Nice. Thus in the seventh century the language of France had come to differ widely from Latin. It was now called Romanic.

The development of the French language now bifurcated into two parts. The French of the north was called the *langue d'oïl*, that of the south the *langue d'oc*. These two words, *oïl* and *oc*, meant *yes* in the north and south respectively. The *langue d'oc* developed into modern Provençal; the *langue d'oïl* into modern literary French. The former tongue achieved a wide celebrity during the 12th century as the language of the troubadours. New words were drawn into the French language during and preceding the Renaissance by almost direct adoption from the Latin. Italian and Spanish have each contributed several hundreds of words to French. The French language is now standardized and modified by the famous *Académie Française*, founded in 1635 and suppressed (for but a short time) in 1793. The chief recent modifications of the French language have been caused by an influx of scientific terms, largely Greek, and another influx of borrowed English words.

French Literature. See LITERATURE.

French Military Territories were three in number, but in 1904 were broken up. The second was handed over to the civil administration, the third and first amalgamated as the military territory of the Niger. See UPPER SENEGAL AND NIGER COLONY.

French Oceania. See NEW CALEDONIA and SOCIETY ISLANDS.

French, Major-General J. D. P., a British cavalry-officer who distinguished himself in the Egyptian campaign (1884–85) and especially in the Boer War (1899–1901).

He was born at Ripple in Kent on Sept. 28, 1852, and early entered the navy, but exchanged into the army (1874), where he became noted as an excellent cavalry-officer. Before the outbreak of the Boer War (October, 1899) he was in command of the cavalry brigade at Aldershot, which he resigned to accompany Redvers Buller to take command of the British cavalry in Natal. He fought the battle of Elandslaagte, and later, under Lord Roberts in Orange River Colony, he raised the siege of Kimberley (Feb. 15, 1900), and became one of the most successful of the British generals in the war. He now is the head of the British army.

French Revolution, The, a period in France, in the latter years of the 18th century (specifically between 1789 and 1795), of wild tumult and revolt, marked in the capital by the ungovernable and unnatural excesses of a frenzied populace. The occasion of the violent outbreak was the effort of the nation, represented by the Third Estate in the states-general, which was convened in May, 1789, to free itself from absolutism in the monarchy and to secure the abolition of the privileged classes and of all the caste distinctions and feudal abuses; the reform of the church; the reorganization of the national finances; and the reconstitution of the government. These things occurred when Louis XVI was king, surrounded by an extravagant and profligate court and by a corrupt and licentious nobility. The king, who had come to the throne in 1774, though well-meaning and recognizing the need of economy and reform, was weak and wanting in firmness for so new and exacting a situation. The financial situation, grappled with by Necker, might itself have been remedied but for the unwise interference of the king. Necker finally demanded the convocation of the states-general, which had not met since 1614. They met on the 5th of May, 1789, but as the nobles and clergy refused to recognize the Third Estate properly, the deputies of this body assumed the title of the national constituent assembly and proposed to give France a constitution. The clergy and nobles yielded; foreign troops were brought to Paris; but the people flew to arms, and on the 14th of July the Bastille was captured and destroyed. On the fifth of October Versailles was attacked by the mob and the royal family were taken to Paris, virtually prisoners. A new constitution formed by the assembly was sworn to by the king on the 14th of September. This constitution deprived the king of arbitrary powers, providing liberty of worship and freedom of the press, of commerce and of industry. In accordance with the constitution the legislative assembly succeeded the constituent assembly, meeting on Oct. 1, 1791. In this body there were two parties, the Girondists, moderate republicans, and the Montagnards, extreme radicals. The monarchists already were powerless. Threats of foreign intervention on behalf of the king led to a declaration of war against Austria and Prussia, April 20, 1792. With French reverses came a popular uprising, and the Tuileries, after a bloody combat, was taken and sacked. A national convention was convened in place of the assembly, and its first act was to proclaim a republic. The king was sentenced to death and was executed on Jan. 21, 1793. A committee of public safety, with sovereign authority, was appointed, and the Reign of Terror was begun. The Montagnards or Jacobins came into power, Christianity was formally abolished, opposing factions were put down with frightful bloodshed, the queen was executed on Oct. 16, 1793, the Girondists on Oct. 31, and the bloody work went on under the leadership of Robespierre. The Reign of Terror finally came to an end by the execution of Robespierre and his associates, July 27 and 28, 1794. In 1795 the convention gave the republic a new constitution and was dissolved on Oct. 26. Then arose Bonaparte and the diversion of the national mind by the campaign in Italy and the expedition to Egypt. The era closed with the return to France of the future idol of the nation, the rise of the consulate and, finally, the establishment of the empire.

French Somali Coast or **Protectorate.** See SOMALILAND.

French West Africa has had one general government since Oct. 1, 1902, being divided into the colonies of Senegal, French Guinea, the Ivory Coast and Dahomey and the territories of Senegal and the Niger, each of which is treated independently. Each colony has a lieutenant-governor under the governor-general of the entire tract, assisted by a secretary-general and a permanent delegate situated at Dakar. With the divisions mentioned are to be included the territories of the Upper Senegal, of the Middle Niger, and the Military Territory, toward which each of the four colonies contributes. In 1907 France expended 15,813,115 francs, most of it for military purposes. A loan of 65,000,000 francs has been contracted, the money to be spent in railways, harbors and sanitary work. Great Britain has ceded a port accessible to sea-going vessels on the Gambia, as well as the Los Islands, formerly belonging to Sierra Leone. By the convention of 1904 about 8,000 square miles had been taken from British and added to French territory, giving a better route from the Niger region to Zinder and Lake Chad.

Frere (*frâr*), **Pierre Edouard,** a French painter, was born at Paris, Jan. 10, 1819. He studied under Delaroche. His paintings are mostly figures and scenes from domestic life. They are good subjects for engraving, and are well known in art-stores. Ruskin was enthusiastic in praise of several of his works, which were shown in the French gallery in 1857. The *Seamstress*, *Little Gourmand*, *Preparing for Church* and the *Gleaner Boy* are among his best-known pictures. *Preparing for Church* is in Corcoran Gallery at Washington. He died on May 23, 1886.

Fresnel (*frā'nĕl'*), **Augustin Jean,** a French engineer distinguished as the principal founder of the modern wave-theory of light, was born in Normandy in 1788 and died near Paris in 1827. As a child he was not considered brilliant, but, nevertheless, he was ready to enter the Polytechnic school in Paris at 16. In 1816, through the influence of Arago, he received an appointment in Paris, where he remained during the rest of his life. When we recall that his first studies in optics date from 1814, his accomplishments during the 11 years of his Paris residence almost surpass belief. The great advances which he made over Grimaldi, Hooke, Huygens, Young and other advocates of the wave-theory consist in the introduction of the idea of transverse vibrations in the ether and in the combination of the principle of Huygens with that of interference. Fresnel's works were published in 1866 by the French government in three superb quartos.

Fresno, Cal., capital of Fresno County, on the Southern Pacific Railroad, situated about 20 miles east of San Joaquin River and 40 miles north of Tulare Lake, in a region devoted to sheep-raising, wheat and fruit-growing, with the cultivation of the grape and wine-making. The raisin-trade alone is valued at $3,000,000 annually, and the olive-trade is also large. It is 200 miles southeast of San Francisco. It has an active civic life, and is supplied with street-railways, electric lights and good water-power from the falls of the San Joaquin. Population 24,892.

Freytag (*frī'täg*), **Gustav,** a German novelist and play-writer, was born in Silesia, July 13, 1816, and died at Wiesbaden, April 30, 1895. He studied at Breslau and Berlin, and lectured on German literature in the University of Breslau. He edited a newspaper at Leipsic, and held a court-position at Gotha. He wrote poems, successful plays and novels. His best-known work is *Debit and Credit*, which has appeared in several English translations. *The Lost Manuscript* and a series called *Our Ancestors* were nearly as popular, while the plays, *The Valentine* and *Count Waldemar*, were brilliant successes.

Frick, Henry Clay, capitalist and manufacturer, was born at West Overton, Pa., on Dec. 19, 1849. He completed his education at Otterbein University, Ohio, and in 1869 accepted a position as bookkeeper in his grandfather's office at Broad Ford, Pa., where he soon became interested in the coking-coal deposits of that vicinity. He formed a company to buy 300 acres of coke-lands and start coke-ovens. The business grew rapidly, and he used the profits to buy more coke-and-coal lands. By 1882 the capital of this company, which bears his name, had been increased to $10,000,000. It now is probably the largest producer of coke in the world, and owns 40,000 acres of coal-lands.

In 1892 Mr. Frick became president of the Carnegie Steel Company, when it had a capital of $25,000,000. In that year much trouble was caused by a strike of its employees, in connection with which he was shot and stabbed by an anarchist. He recovered, however; carried the day against the strikers; and by his firmness, decision and fairness so won their approval that there has since that time been very little labor-trouble in the companies with which he is connected. He has retired to a considerable extent from active business management.

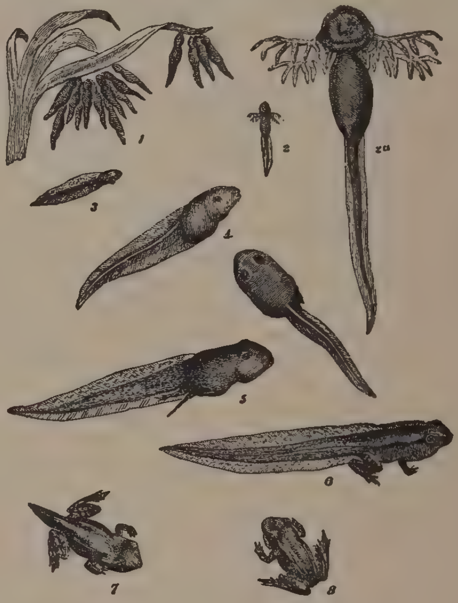
Friendly Islands or Tonga Group lie 250 miles southeast of Fiji. The total area is only 390 square miles. Most of the islands are coral formations, but some are volcanic. There are several active volcanoes. Earthquakes are frequent. The islands were discovered by Tasman in 1643, and named by Cook in 1777. Among the products are tropical fruits, copra, coffee, sponges and cocoanuts. The native animals are few. Missionary work on the islands has, since 1827, been done by the Methodists. Almost all the islanders are Christians; many can speak English; and schools are numerous. The people are in many ways superior to the other South Sea islanders. But they are decreasing in numbers and have dwindled to 23,011. Since 1845 the islands have been under the rule of one chief, and they have a constitution and a parliament. By agreement of the European powers in 1896 the islands wereallowed to remain neutral; but British interests have long been predominant, and the islands are a protectorate of Great Britain. The protectorate was declared in 1899, and in 1904 the British High Commissioner assumed control of the legal and financial administration. The revenue, chiefly derived from customs, amounted in 1910 to about $220,000, while the expenditures were $213,000. The trade (import and export) is chiefly with New Zealand, New South Wales and Great Britain. Two ships of the New Zealand Union Company visit the group every four weeks, between Auckland and Tonga, Samoa, Fiji and Sydney. See H. S. Cooper's *Coral Islands*.

Friends, Society of. See QUAKERS.

Frigate-Bird, a sea-bird related to the pelicans, because of its warlike attitude toward other birds is known as the man-of-war bird, though this name is given also to the albatross (*q. v.*) and other birds. It is very large, the spread of wings sometimes being ten feet, and has an extremely long, forked tail and a bill five inches long, hooked at the end. It has a pouch, which is inflated in flight and becomes bright scarlet during the breeding-season. In color the bird is blackish-brown with green and purple reflections; the feathers are much in use for headdress in the Pacific islands. Throughout the tropic regions the bird is met with, and it has been known to wander as far north as Nova Scotia. It is a true ocean-bird, seldom coming to land except to roost on trees near the breeding-quarters. The slightly-built nest is placed in a tree or bush, occasionally on the ground or bare rock, and contains one egg. It is said that both male and female incubate, sitting close together and snapping at any intruder. The flight of the frigate-bird is wonderfully swift and long-sustained. The birds are usually seen singly or in pairs. They do not dive for their prey, but with ease seize the surface-swimming birds that constitute their chief food; they also feed on squids, small crabs, flying fish and young turtles. They are adept as robbers, forcing terns and boobies to give up their prey and catching it before it reaches the water. It has been asserted that they pass from Africa to South America in a day.

Fro'bisher, Sir Martin, one of the great seamen of the age of Elizabeth, was born in Yorkshire about 1535. Sent to sea as a boy, he formed, at an early age, his lifelong dream of a northwest passage to Cathay. Following out this idea, he made three voyages to the region of Labrador. Later on he commanded a vessel in Drake's expedition to the West Indies, and covered himself with glory by his conduct in the struggle with the Spanish Armada. His later years were spent in scouring the seas for the treasure-ships bound from the New World to Spain. At the siege of Croyzon, near Brest, in 1594, he was wounded, and died at Plymouth, England on Nov. 7 of the same year. See *Life* by Rev. F. Jones.

Froebel (*frē'bel*), **Friedrich Wilhelm August,** a German reformer in education, was born in Thuringia, April 21, 1782. His early years were spent partly in study and partly in teaching, for which he had a marvelous fitness. His underlying idea in education was to follow nature in the unfolding of the pupil's mind; letting it grow and expand as a plant grows, according to its nature This idea he had an opportunity to carry out, when, in 1817, he opened a school at Griesheim, in Thuringia, which he soon transferred to Keilhau. He wrote a work explaining his views, and, with the object of extending his system, started several branch-schools and began to train teachers. In 1836 Froebel opened at Blankenburg, not far from Keilhau, his first kindergarten, a system of teaching children which has since become popular in all circles of education. The remainder of his life was spent in working out this new system. Froebel has exerted a great influence on education in this country, perhaps greater than either Pestalozzi or Herbart. His principal work is *The Education of Man*, translated by Josephine Jarvis. He died on June 21, 1852. For kindergarten see SCHOOL; MODERN EDUCATION; CHILD-STUDY; SELF-ACTIVITY; GAMES.



STAGES IN THE LIFE-HISTORY OF THE FROG

Frog, a common, tailless amphibian, with webbed feet, and hind legs adapted for leaping; hatching as a tadpole and passing from a water-breather to an air-breather. The frog belongs to the same group with toads, salamanders etc. Its life-history is very interesting, because it represents that phase of animal life through which the race of higher animals must have passed in changing from water-animals to land-animals. There is good reason to believe that animal-life began with aquatic animals and that the terrestrial animals sprang from them. As is well known to embryologists, all the higher animals pass through a stage, in the egg, in which they have rudimentary gill-slits and gill-arches, with blood vessels arranged on the fish-like pattern. (See DEVELOPMENT.) The frogs hatch at the level of a fish, and, while leading an independent life, they pass through the stages that higher animals pass before birth. Frogs and toads are much alike; in the tadpole stage they live on vegetable matter, but, after the metamorphosis, catch insects, slugs etc. by a long, flexible tongue. When first hatched, the young tadpole has external, feather-like gills. Soon these disappear, and then internal gills are used in breathing. Then fore and hind limbs make their appearance, and the tadpole is a tailed frog. The tail disappears gradually; it does not drop off nor simply shrivel, but is used as food by the growing animal. Numerous, white blood-corpuscles creep through its substance, and carry minute portions of it forward for the nourishment of the animal, and thus it is gradually consumed. In the meantime great changes have been taking place in the internal organs — the lungs are developed, the system of blood-vessels is changed and the digestive system is made over into one fitted for animal food. The changes in the blood-system are very remarkable. Aortic arches disappear, and the heart changes from a fish-like heart, with auricle and ventricle, to an amphibian heart, with three chambers, intermediate between the fish-heart and the four-chambered heart of the higher animals. The largest frog in the United States is the bullfrog, which measures, when extended, 18 to 21 inches. The hind-limbs of frogs are much eaten as delicacies. See Marshall's *The Frog* and Dickerson's *The Frog Book.*

Froissart (*froi'särt*), **Jean,** a historian of the middle ages, was born at Valenciennes, France, about 1337. He was educated for the church, but spent his youth in gayety and dissipation. When 20 years old, he began his famous *Chronicle* or *History.* After completing the first section of his work, Froissart set out on his protracted travels in quest of adventure and good company. He visited England, where he became the favorite of the wife of Edward III. He traveled through Scotland with only his riding-palfrey and a greyhound as companions, where he was entertained by King David Bruce and the Earl of Douglas. In the train of the Black Prince he journeyed to Aquitaine, and soon after he is found in Italy. He became a curate, and for a while settled down, but again gave way to the old roving impulse. He ended his days as canon at Chimay in 1410. His famous *Chronicle* deals with the period between 1326 and 1400; and, though mainly occupied with the affairs of France and England, Scotland and Flanders, he likewise gives much valuable information in regard to Germany, Italy and Spain. He gathered his materials in courts and on highways, from the lips of lords and knights, squires and heralds. He was a born story-teller, and his pages glow with color. His book is the most vivid and entertaining of all medieval chronicles. He was the Herodotus of the middle ages.

Frond (in plants), a name chiefly applied to the leaves of ferns, under the impression that they are not like ordinary leaves, but are a combination of stem and leaf. The word is passing into disuse.

Fron'tenac', Compte de, was born in France in 1620, and died in Quebec in 1698. Becoming brigadier at an early age, he was appointed governor of the French possessions in North America and remained for ten years. The Indians feared him, yet he won their respect. The settlers trusted him. Parkman narrates how he crushed the Iroquois and freed the colony from their lawlessness. No more interesting incidents can be referred to in early Canadian history than those suggested by the name of Frontenac. Frontenac, a nobleman of long descent, representing the most powerful court in Europe, adapted himself readily to the new-world environment. He would carry a pack over a portage or push a canoe through the rapids as skillfully as a native. He is entitled to first place in the list of French governors. His first glimpse of the Great Lakes kindled a desire to extend westward the influence of France. Frontenac County on the north shore of Lake Ontario is called after him. Speaking of Count Frontenac, one writer says: "He twice rescued the colony from the destruction that seemed inevitable and changed the course of New World history by stemming the hostile tide that threatened to sweep French settlers and French influence alike out of the St. Lawrence basin."

A plan of Fort Frontenac (at Kingston, Ontario) made in 1787 can be seen in Abbé Foillions' *History of Ville Marie* (Montreal). The fort there shown was destroyed in 1689 by Governor Denonville, and restored by Count Frontenac in 1695.

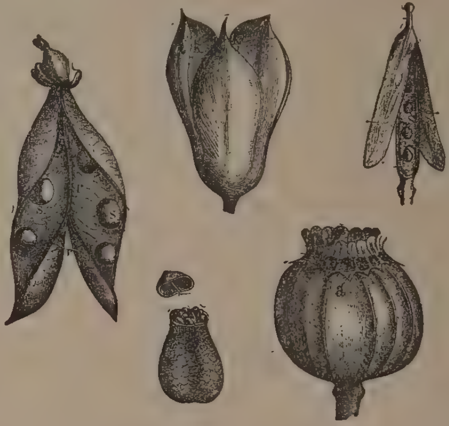
Frontenac County, on the north shore of Lake Ontario in the eastern part of Ontario, contains unsurpassed feldspar and mica-deposits, which extend to adjoining counties. A richly mineralized district, it possesses historical interest.

Frost, either the process of freezing or the crystals of frozen dew. These crystals are also called hoar frost. When air condenses at a temperature above freezing point (32° F.), the result is dew; but when the air contains so little water-vapor or is already at so low a temperature that condensation does not take place until the temperature is below freezing point, the result is frozen dew or frost. The most remarkable formations of frost are seen on the crest of Mount Washington during the autumn and winter, when crystals a foot or more in length fasten themselves to every object. The destructive effects of frost on tender plants are well-known. When plants radiate or pass off their heat faster than it can be supplied from the air around, they are frosted. This is most liable to happen on clear nights, as the clouds act as a screen to check radiation. Smoke acts in the same way as clouds, so that frost is more common in country districts than in towns. A well-known form of frost is the frost-work or ice-crystals seen when the moisture in the air of a warm room condenses on the glass of the window, the glass being below freezing point. Black frost is the effect produced when the moisture within a plant is frozen, but without any hoar frost being formed on the outside.

JAMES A. FROUDE

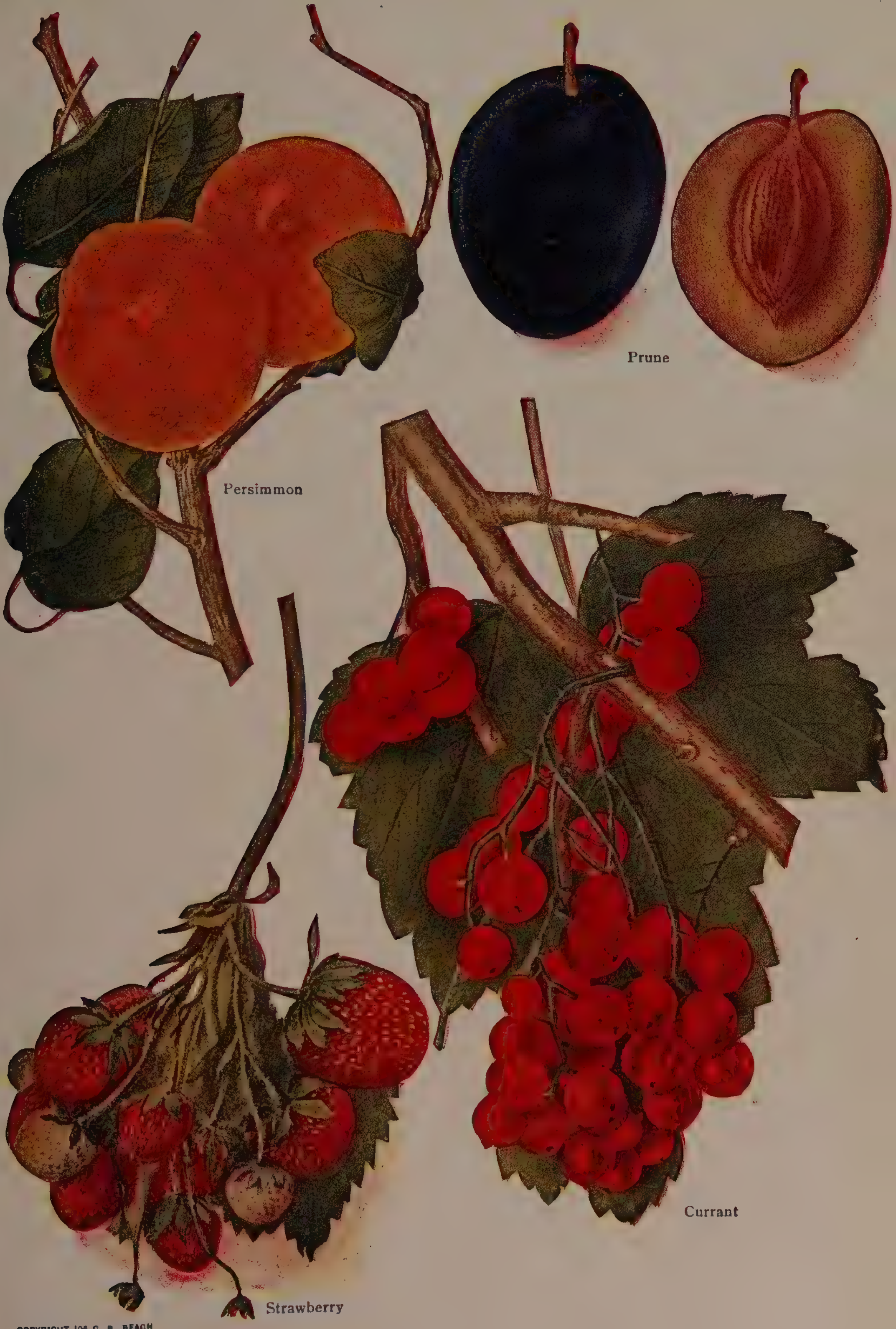
Froude (*frōōd*), **James Anthony,** an English historian, was born at Dartington, Devonshire, April 23, 1818. His early literary work appeared largely as contributions to magazines; but in 1856 appeared the first volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada.* Later on he published four volumes of brilliant essays entitled *Short Studies on Great Subjects.* Among more recent works are a sketch of *Julius Cæsar* and *Oceana*, the latter an account of a voyage to Australia and some of the Pacific islands. In 1873–74 appeared *The English in Ireland in the Eighteenth Century.* Froude was for some years rector of St. Andrew's University and editor of *Fraser's Magazine.* In 1892 he was appointed regius professor of history at Oxford. Froude had fine literary ability, and in the art of making history as fascinating as fiction Macaulay is his only rival; but he lacked the critical fairness and accuracy of modern historians, a fault which greatly impairs the permanent value of his works. He died on Oct. 20, 1894.

Fruit. When seeds are formed, contiguous parts become more or less modified, and the resulting structure is called a fruit. The parts involved in a fruit vary widely in different plants. Sometimes only the ovary is involved, as in the bean-pod; sometimes the cup-like part of the flower which bears the floral leaves is included, as in the apple; sometimes the very much enlarged receptacle is included, as in the strawberry; while in the pineapple the fruit is the whole flower-cluster, with its axis, bracts, flowers and all. Fruits may be roughly classified in two groups: (1) those which ripen dry and (2) those which ripen fleshy. The dry fruits are further divided into those which dehisce, that is, open in some way to discharge the seeds, and those which do not dehisce, the fruit being carried away with the seed. Among dry fruits which do not dehisce are the akene (sometimes spelled achene), in which a single seed is so closely invested by the ovary as to make a seed-like fruit, as in the sunflower, dandelion, strawberry pits etc.; and the characteristic grain of wheat, corn and other cereals. Among dry fruits which dehisce, called in general pods, are the follicle, a single ripened carpel which splits down one side, as in the peony; the legume (generally called pod), a single ripened carpel which splits into two parts (valves), as in the pea and bean; the capsule, a ripened pistil of several carpels which opens in various ways, as in the hollyhock and violet; the silique, the peculiar pod of the mustard family, with a false partition; the silicle, a short silique; the pyxis, a capsule which opens by a lid, as in the twin-leaf (*Jeffersonia*). The fleshy fruits do not dehisce, and among them are the berry which is pulpy throughout and with a thin rind, as the grape, currant, tomato etc.; the drupe or stone fruit, in which the ovary wall develops an outer fleshy part and an inner bony part (stone), the seed being the kernel, as the peach, cherry, plum etc.; the drupelet, a small drupe, as the grains of the blackberry, raspberry etc.; the pome, in which certain flower-parts outside the ovary form the flesh, as the apple, pear etc., the ripened ovary being the core.



VARIOUS FORMS OF DRY, DEHISCENT FRUIT

Fry, Elizabeth, was born on May 21, 1780, near Norfolk, the daughter of John Gurney, a banker. She had no deep religious opinions until, at 18, a sermon she heard in the Friends' meeting-house turned her thoughts in that direction. She began working among the poor, and founded a school for poor children, which she managed entirely herself, even when the number of scholars increased to more than 70. She married, and later became a preacher among the Friends. In 1813 she first saw the miserable condition of the 300 women,



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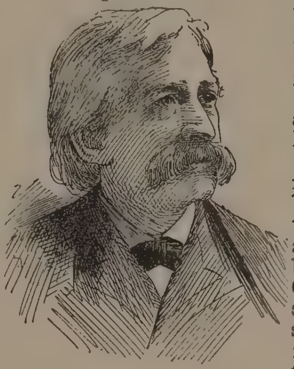
with their children, in Newgate Prison, and her attention was turned to prison-reform. By her efforts a school and manufactory were begun in the prison, an association formed to improve the prisoners and provide them with religious instruction, and a matron was appointed. Mrs. Fry visited prisons in different parts of Great Britain and on the European continent, everywhere effecting ameliorations. She died at Ramsgate, Oct. 12, 1845. See *Life* by Mrs. Pitman.

Fuegians (*fū-ē′jĭ-an*), or inhabitants of Tierra del Fuego are an interesting race, having a language or, rather, several languages different from all other known tongues. Several tribes are to be distinguished among them, including the Ona in the northwest, the Aliculuf in the center and the almost extinct Yahgans. All these tribes are ill-clothed and sheltered, yet skilled in basketry and in the making of weapons and canoes. It is likely that they will before long be extinct, for the owners and herdsmen of sheep are making sad havoc among them.

Fugitive-Slave Laws, The, were laws formerly in force in the United States to enable slave-owners to reclaim slaves who had escaped from them into another state. As slavery was a state affair, being recognized in some states and not in others, the logical outcome seemed to be that a slave ceased to be a slave when he entered a state in which slavery was not tolerated. This was true, unless one held strictly to the view that a slave was simply the private property of the owner, in which case the private property could be recovered through the intervention of Federal officials. On the assumption that a slave was private property, the Fugitive-Slave bill of 1793 was passed, giving the alleged owner the right to seize a person whom he could prove, before judge or local magistrate, to be his fugitive slave, and remove him to his own state. This law was much abused by kidnappers of free negroes, since a negro so seized was practically at the mercy of one who was willing to swear that he was his escaped slave, and the alleged slave was debarred from the right to demand a writ of *habeas-corpus* or a trial by jury.

Meanwhile states prohibiting slavery in some instances passed laws with a view to nullifying the laws permitting slave-extradition in this fashion, on the ground that state laws were here supreme. This led to much agitation on the part of slave-owners, and led to the passing of the Federal law of 1850 which denied the right of a slave to a writ of *habeas-corpus* or a trial by jury, and placed the enforcement of the law entirely in the hands of the officials of the Federal government. This second fugitive-slave law was repealed in 1864.

Fuller, Melville Weston, chief-justice of the supreme court of the United States, was born at Augusta, Me., Feb. 11, 1833, and graduated from Bowdoin College and Harvard Law School. In 1855 he was admitted to the bar and practiced for a time at Augusta, Me., but removed to Chicago and pursued his profession there until 1888, when he took the oath of office as chief-justice, the post being offered him by President Cleveland. In the sixties he was a member of the Illinois state legislature, and was repeatedly delegate to the Democratic national conventions. Bowdoin College, Northwestern University and Harvard each conferred upon him the honorary degree of LL.D. He died July 4, 1911.



MELVILLE W. FULLER

Fuller, Sarah Margaret, Marchioness Ossoli, an American author, was born at Cambridgeport, Mass., May 23, 1810. After the death of her father, a lawyer and congressman, she supported herself for some time by teaching. Later on, in Boston, she edited *The Dial.* In 1844 she wrote *Women in the Nineteenth Century*, and in the same year, at the invitation of Horace Greeley, she went to New York and contributed articles to *The Tribune*, which were afterwards collected as *Papers on Literature and Art.* She afterwards went to Europe, and in 1847 met at Rome the Marquis Ossoli, to whom she was soon after married. She entered with enthusiasm into the struggle for Italian independence. In 1849, during the siege of Rome, she took charge of a hospital; and, on the capture of the city by the French, she and her husband and their child, after a period of hiding, set sail for America in 1850. The vessel was driven on Fire Island, near New York, by a violent gale in the early morning of July 16; the child's body was found on the beach; but nothing was ever seen afterward of Margaret Fuller or her husband. See *Life* by T. W. Higginson.

Fulton (*ful′tŭn*), **Robert.** When Robert Fulton launched the first steamboat, the *Clermont*, on the Hudson River, in 1807, his old friends in Lancaster, Pennsylvania, probably were not surprised. They had always expected the quick-witted, ingenious Irish boy, who had grown up among them, to do something remarkable, and they were proud and glad of his success. He had been such a manly, good-tempered, handsome boy, that everyone who knew him, loved and admired him. A busy city of 50,000 people to-day, Lancaster, at the time of the Revolutionary War, was only a farming village in the rich valley of the Susquehanna. The Dutch and Quakers who dwelt there were very sober people and prone to be critical of conduct; so Robert Fulton, the lively, imaginative son of poor Irish immigrants, must have been an exemplary youth to have won their approval.

This inventor of the steamboat was born on November 14, 1765, on a farm in what now is Fulton township, but the family soon afterwards moved to town and, the father dying, was left to a rather precarious manner of living. At a very early age Robert was earning money by painting miniatures, so the prediction was freely made that he was to become as famous a painter as Benjamin West, a Quaker boy who had gone to London. Many held to the opinion that the boy was to be an inventor, for his talent for mechanics was equally well-marked in boyhood. He powdered lead and made his own pencils; he attached a paddle-wheel, worked with a crank, to his pole-boat, so as to leave himself free to fish; he pulled heavy loads up a hill by means of an inclined plane and a windlass; and he made his own rockets for celebrating the Fourth of July. He designed guns for the gunsmith and then calculated how far they would shoot. For the making of these boyish devices he had to study mathematics and physics, and he applied the same principles that he used in later inventions. Besides, he learned everything he could from practical workmen. The smith, the chemist and the miller delighted to talk to him, because he asked no idle questions, and he never broke or mislaid a tool he was permitted to use. For a long time he was making mysterious experiments with mercury, and so got the nickname of Quicksilver Bob, which so accurately described his active fingers and brain that the name stuck to him, even after he became famous.

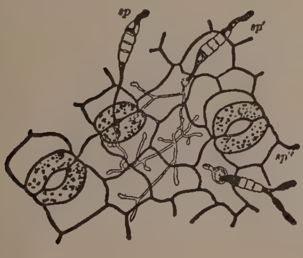
At 17 Fulton went to Philadelphia to study art. So well did he use his time and talents that at 21 he had $400 to invest in a farm for his mother and sisters. He took the long journey across the Alleghanies and back to see them comfortably settled, before going to London to continue his studies under Benjamin West. It was this act of filial duty that turned his thoughts from art to engineering. He had seen many rich valleys that were unsettled because farm-produce could not, except at great expense, be brought out of them to market. The locomotive was not yet invented. Everyone expected that a network of canals was to solve the transportation-problem, with horses on a tow-path pulling huge flat-boats. But Fulton already had the idea of using steam instead of horse-power. On the ocean there was the further necessity of protecting the carrying trade from interference by powerful navies. So the ideas of better and cheaper canals, of swifter travel by steam and of explosives began to occupy his mind, although he continued to paint. He was slowly winning recognition as an engineer and inventor by the substitution of cast-iron for stone in aqueducts and the introduction of the inclined plane, in place of locks, in small canals. He also invented a dredging-machine, a marble-cutter and a flaxspinning frame.

A man less in earnest would have had his head turned by his popularity in London and Paris, but he used his social success to further his serious plans. He invented a torpedo to be fired from a submarine or diving boat and set off by clock-work. That France failed to see the value of the invention was one of those curious instances of shortsightedness in men and governments. Fulton's patriotism was shown by his refusal of an offer for the secret from England. Had the United States purchased the invention and set Fulton to perfecting it, the War of 1812 might have been avoided or much shortened. Disappointed in getting recognition for his torpedo, Fulton turned his attention to the steamboat. The stationary engine of James Watt was then in general use in England, in mine and mill and factory. The inventor's mind recurred to the pole-boat in which he had fished on the Susquehanna and the paddle-wheel he had devised to propel it. Why could not a paddle-wheel of any size be turned by steam-power? Theoretically it could, but there were many steps to be taken, long years of experimenting and much money required to put this simple idea into practical use. The first boat, built on the Seine at Paris, broke in two from the weight of the engine and sank. The second boat had too small an engine for the load. But Fulton learned success by failure. In 1806 he had an engine constructed in England after a special design and shipped to New York. He knew how to make the steamboat, and he wanted to launch the first one in his native country, on the Hudson.

Although an enthusiast, a dreamer, Robert Fulton was determined, untiring, shrewd, practical. He had money of his own, and he interested other men of wealth and influence who secured a monopoly of traffic by "fire-boats" on the waters of New York. When he began to build the *Clermont* on East River, it was ridiculed as Fulton's Folly. Beside the graceful sailing-vessels on the river, the paddle-wheel steamer "looked like a back-woods saw-mill mounted on a scow and set on fire," as Robert Livingston wittily described it. But the inventor persuaded a party of prominent men and women to make the trial-trip with him to Albany. His guests slept in hammocks hung on deck; Fulton, too excited to sleep, watched the machinery during the entire 30 hours. What were his thoughts as he listened to the business-like *chug-chug* of the engine, the splash of the paddles, and watched the smoke and sparks from the pine-wood fire trail back over the dark Hudson?

The inventor leaped into instant fame, steamboats could not be built fast enough to satisfy the demand, nor one be made perfect enough to satisfy its maker. He busied himself with planning the Erie Canal besides, and became an authority on explosives. When the War of 1812 broke out, he was commissioned by the government to build the first steam naval vessel. While superintending the construction of this, he contracted a severe cold and died suddenly on February 24, 1815. His death was untimely, in point of years, but few men have lived so much to the purpose, or won so much deserved love and honor as Quicksilver Bob. See *Robert Fulton and Steam-Navigation* by Thomas W. Knox. See, also, FITCH, JOHN.

Fundy, Bay of, an arm of the Atlantic, separating Nova Scotia from New Brunswick. It branches at its head into two inlets, Chignecto Bay and Minas Basin, which are separated by narrow necks of land from the Gulf of St. Lawrence. Its greatest breadth is 45 miles, and its length, up to Chignecto Bay, is 140 miles. It receives the St. John and St. Croix Rivers. Navigation is made dangerous by the tides, which rush in with impetuous force, rising rapidly from 60 to 70 feet.



GERM TUBES OF FUNGI

Part of the surface of a leaf showing the cells of the epidermis (outlined by solid lines), with three stomata. *sp*, *sp′*, *sp″* are three spores of a fungus, germinating. The germ tubes from *sp* and *sp′* are entering stomata; that from *sp″* is penetrating the cell wall.

Fun′gi (*fŭn′jī*). In general, fungi are low plants (*Thallophytes*) which do not contain chlorophyll, in contrast with the algæ, which do. As a consequence fungi cannot manufacture their own food out of raw materials, as do the algæ, and are dependent for it upon other plants or upon animals. In obtaining this food they have cultivated two habits. Some are parasites, that is, they prey upon living plants and animals, which are then called hosts. Some of the parasitic fungi are very injurious or even destructive to their hosts. They may grow upon the surface of the host, sending suckers into the body as in the common mildews; or they may burrow within the body of the host, as in the wheat-rust. Parasitic fungi destroy an immense number of useful plants and animals and also many other plants and animals to which we pay no attention. Other fungi are *saprophytes;* that is, they use for food decaying bodies of plants and animals or the products of living bodies. For example, the common mushrooms use decaying vegetation; the common blue-mould grows on old bread, jars of fruit etc. Saprophytes in general are beneficial, since they are great scavengers. Some fungi may be either parasites or saprophytes as occasion demands. The body of an ordinary fungus is a more or less interwoven mass of delicate threads, called the mycelium (plural mycelia), the individual threads being called hyphæ (singular hypha). It is the mycelium of the parasitic forms which spreads on the surface of the host or burrows into its tissues. The four prominent groups of fungi are the *Phycomycetes*, containing such forms as the black-moulds and downy mildews; the *Ascomycetes*, containing the mildews, blue moulds, truffles, cup-fungi and probably the yeasts; the *Æcidiomycetes*, containing the rusts and smuts; and the *Basidiomycetes*, containing the mushrooms, toadstools and puff-balls. See the names of these groups.

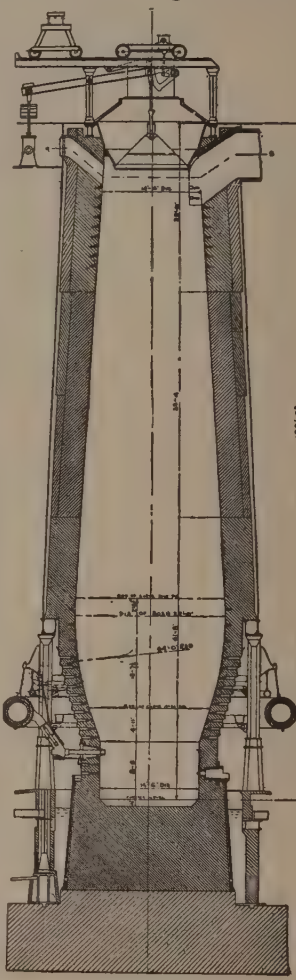
JOHN M. COULTER.

Fur is the covering of certain animals, especially those that inhabit the lands or waters of cold countries. It is distinguished from hair by its greater softness and fineness. Furs are among the first materials used for clothing and also for covering couches and the floors of tents. They early became an important article of trade in Europe, and were used a great deal by the higher classes. One French king used 746 ermines for the lining of one of his coats. In North America there always has been a large trade in furs. Forts were established to protect and control the trade, and the great Hudson Bay Company grew up, which acquired control over a vast territory but now is a trading-company. The furs collected are sold at the great half-yearly sales of the company in London. The fur-trade has played an important part in the settlement of the northwest. One of the most prominent men engaged in it was John Jacob Astor, who founded Astoria. (See ASTORIA.) The purchase of Alaska in 1867 opened to Americans a new field for the fur-trade. The furs from this territory are mostly those of the fur seal, the otter and general furs, as those of the beaver, fox, marten and bear. The yearly value of this fur-trade is over $1,200,000, and the government receives a tax of over $300,000 for the taking of seals. The most fashionable and costly fur of all is the Russian sable, some of the finest of which sell for over $200 apiece. Among other furs now sold are those of the black bear, badger, beaver, chinchilla, ermine, fox, leopard, marten, mink, raccoon, skunk, squirrel, wolf and wolverine. The usual mode of dressing furs is by steeping them in liquor for a short time, after which the pelts are "fleshed" over a sharp knife to get rid of the excess of fat, etc. and then dried off; they are next trodden by the feet in tubs of warm sawdust and common butter, by which the pelt or leather is made supple; the skin is then finished in dry sawdust and beaten out.

Furies, The or **Erinys, Diræ** and **Eumenides,** were, in Greek mythology, female divinities who were avengers of iniquity. These goddesses were daughters of Night, or, according to another myth, of Earth and Darkness, who sprang from the blood of the mutilated Uranus. Their number varied, but they usually are spoken of as three: Megæra (the grimly jealous), Alecto (the unwearied persecutor) and Tisiphone (the avenger of murder). Nothing, it is said, escaped their sharp eyes as they pursued the evil-doer with speed and fury, permitting him no rest. They were variously represented, at one time as female figures of odious aspect, clad in black, sometimes winged, with hair formed of vipers and carrying a serpent, a knife or a torch; at another time, they were characterized as divine beings, whose functions were to punish neglect of duty and breach of faith, yet who were looked upon as preservers of a high morality and hence were called Eumenides or the well-minded goddesses. Their abode was Colonos, near Athens.

Fur′nace, in general any arrangement in which heat is produced by burning fuel. It usually is a structure of iron or brick, lined with fire-brick to withstand intense heat. Furnaces are used for domestic purposes, as heating and cooking; for motive-power, as for steam-boilers; and for metallurgical and chemical processes. For heating and power purposes, see HEATING AND VENTILATION and BOILERS.

Furnaces used in metallurgy are of two kinds: (a) those in which the burning fuel and material to be heated are mixed and (b) flame-furnaces, where the fire-grate is separate from the flame-chamber or working-chamber in which the materials to be heated are placed. The common blacksmith forge is a simple example of the first class. Blast-furnaces and cupolas also belong to this class. A blast-furnace is a vertical structure in which ores of iron are roasted and smelted in contact with suitable fuel and fluxing-materials. The burning of the fuel is accelerated by a blast injected under pressure through openings called tuyères near the bottom. The dimensions of the furnace are such as to produce a thorough mixture and heating of the materials. In all modern blast-furnaces the blast is heated to a high temperature before being forced into the furnace. Blast-furnaces are from 60 to 100 feet high and from 20 to 25 feet in diameter at the middle. The narrowest parts are at the bottom and top. The fuel and the ore with certain fluxes, usually limestone, are introduced in alternate layers at the top. The melted metal gathers at the bottom and is drawn off to be cast into "pigs" or, in many modern furnaces, to be passed directly to the Bessemer converters to be made into steel. There also is formed a slag at the bottom from the melting of the limestone and earthy matters of the ore. This slag floats on the iron and is drawn off separately. The gases which rise are burned to heat the blast and boilers, and have also been used recently in gas-engines. The output of some of the recent American furnaces is very large. That of two furnaces near Cleveland, O., is 600 tons each in every 24 hours.



BLAST FURNACE

The reverberatory furnace is a furnace of the flame-class. The flame-chamber is arched in order that the heat may be reflected and concentrated upon the work on the hearth, and hence comes the name reverberatory. These furnaces are used in metallurgical processes, particularly in handling steel. See STEEL.

The amount of heat utilized in most furnaces is a very small part of the whole produced by the burning of the fuel; the greater part is lost in the escaping gases and in connection with radiation. In most furnaces not over two or three per cent. is utilized. In flame-furnaces this rises to 15 or 20 per cent., and in some blast-furnaces it may rise to 80 per cent.

Furniture-Manufacture. This industry at the present day flourishes more in America than elsewhere. There is, however, no special form or style of furniture recognised as more correct than another. Steam was first applied to the making of furniture in 1815. Several historic styles are still followed in furnituremaking, including the light Chippendale, the heavy mahogany, the elaborate rococo, the severe Gothic and the Spanish-mission style. By 1850 most ordinary furniture was machine-made, for scrolls and ornaments could be readily and cheaply wrought into it by the machines. The best cabinets, however, continued to be made by hand. The great centers of the furniture-industry in the United States are New York, Chicago and Grand Rapids, Mich.; but six other cities in the United States produce furniture to the value of over $2,000,000 yearly. In respect of design America is responsible for many useful contrivances in the manufacture of furniture, including principally folding-beds and rocking-chairs. But lovers of artistic furniture complain that the use of machinery has led to the sacrifice of good taste to economy of production. The recent extension of the teaching of woodwork in American schools is likely to elevate the standard of taste and workmanship in the furniture-manufacture.

Furs. The history of the development of Canada, of the earlier struggles between the French and English for possession, of the opening of the northwest, which is still going on, and of exploration is largely the history of the fur-trade. Though the pursuit of fur-bearing animals has long ceased to be one of the principal industries of Canada, it in 1906 exported no less than $2,464,337 in furs alone. See HUDSON BAY COMPANY.

Fusiyama or Fujiyama *(fōō'jē-yä'mȧ)*, a sacred volcano, the loftiest mountain of Japan, stands on the main island, about 60 miles southwest of Tokio. It rises some 12,200 feet above the sea, with a crater 500 feet deep. Its last eruption was in 1707. The cone is free from snow only from July to September, when thousands of white-robed Buddhist pilgrims make the ascent easily enough. A traveler visiting Japan was asked: "Have you seen it?" "What?" he said. "Oh, it; when you see it, you will know it." And one day when the clouds that had been covering the sky broke away, he saw high up in the heavens the snow-capped peak of Fujiyama, looking like a fairy castle floating on a bank of clouds, and exclaimed, with as much enthusiasm as the Japanese themselves: "Oh! I've seen it! I've seen it!"

Fuze, a means of igniting an explosive at the required instant, whether it is used in blasting, military operations and mines or as the bursting charge of a shell or bomb. It is of two kinds. One is the instantaneous, the other the ordinary fuze, the first burning at 30 feet a second, the other at three feet a minute. The ordinary fuze consists of a train of gunpowder in layers of tape covered with gutta-percha; in the instantaneous fuze, which is distinguished by crossed threads of orange worsted outside, quick match takes the place of gunpowder. Powder-hose is sometimes used when no other fuze is available. It is made of strips of linen, forming, when filled with powder, what is called a sausage, one half to one inch in diameter.

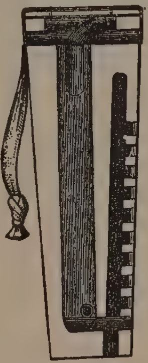


FIG. 1

The fuzes used for shells are of a totally different character and of many patterns. They are of two classes; those which depend for their action upon the rate of burning of the composition in them, called time-fuzes; and those which burst the shell on its striking the target, ground or water, and called percussion-fuzes. Time-fuzes are hollow, truncated cones of beechwood, carrying a column of fuze-composition, which burns at a fixed rate. Marks and figures on the outside show twentieths of a second or less, and indicate where the hole must be made by a fuze-borer in order that the flame may have access through it to the shell at the desired instant during its flight. Time-fuzes are chiefly used with shrapnel shell and mortars. Their length varies from three to six inches, and they are fixed into the head of the shell before firing. The thickness of iron would prevent the passage of the flame through the hole made by the borer in the shorter fuzes, and, therefore, two or more powder-channels are made in them, parallel to the fuze-composition, to communicate its flame to the bursting charge. In guns having windage, that is, in which the ball is smaller than the bore of the gun, the fuze is ignited by the flame of the cartridge enveloping the shell, and quick match is placed on the top of the fuze to facilitate this. A metal-cover protects the quick match until the last moment, and is then torn off by means of a tape provided for that purpose. In guns having no windage a percussion arrangement is placed in the head of the fuze, so that the shock of the discharge may ignite the fuze composition. Fig. 1 shows a section of the

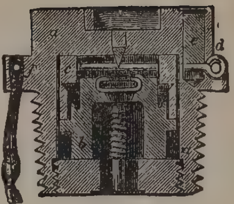


FIG. 2

common time-fuze, through one powder-channel. A section of the percussion-fuze is shown in Fig. 2. It is a hollow, gun-metal cylinder (*a*) so arranged as to screw into the head of the shell. Inside is a movable pellet or ring (*b*) of white metal, driven with fuze-composition like a tube and carrying a percussion-cap. It has four feathers or shoulders projecting from its sides, and above these a gun-metal guard (*c*) fits round the pellet loosely, so as to prevent the cap of the pellet from coming in contact with a steel pin which projects downward from the top of the fuze. A safety pin (*d*) goes through the fuze with the same object, but is removed before firing, and a lead pellet (*e*) then closes the aperture left by its removal. On discharge, the shock of impact on the target or ground causes the pellet to set forward, bringing the cap against the pin, igniting the fuze composition and bursting the shell. Percussion-fuzes are used chiefly with "common" shell. Very many others are in use, chiefly modifications of these two types: *e. g.*, the delay-action fuze has both a percussion and time arrangement, so as to burst the shell an instant after impact. All are delicate and apt to become hopelessly impaired with age or exposure to damp. In the American pneumatic dynamite-gun, the shell contains an electric battery, and the circuit is completed by the shell striking either water or the target.

G

G (*jē*), the seventh letter, is a vocal consonant. It represents two sounds: one simple, as in *gave*, the other compound, like that of *j*, as in *gin* The first is a guttural, its place being the soft palate and the back of the tongue. The simple sound is called hard *g*, the compound one soft *g*. Hard *g* occurs before *a*, *l*, *o*, *r*, *s* or *u* in the same syllable; at the end of a word; sometimes even before *e*, *i* or *y*. Examples: *gay*, *glad*, *go*, *grow*, *bags* and *gun*; *berg*; and *get*, *gig* and *muggy*. Soft *g* usually occurs before *e*, *i* or *y* and in *gaol*. Examples: *gem*, *engine* and *stingy*. *G* is silent before final *m* or *n*, as in *phlegm* and *sign*. So is initial *g* before *n*, as in *gnostic*. In some words, from the French, *g* equals *z*, as *rouge*. *G's* name and shape, a modified *C*, come from Latin, probably through French.

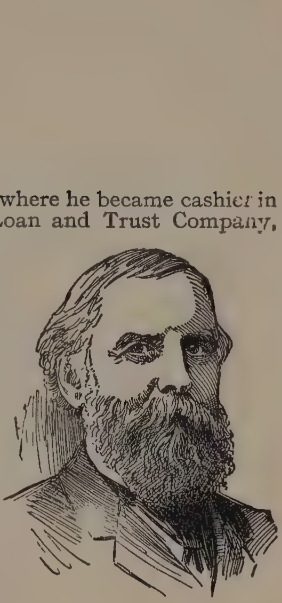
Gabun. See French Congo.

Gadsden Purchase, a name given to that part of New Mexico and Arizona which was purchased from Mexico by Gen. James Gadsden for the United States on Dec. 30, 1853. The sum of $10,000,000 was paid for the territory, which included an area of 45,535 square miles.

Gadski (*gădz'kē*), **Johanna,** German opera singer, born at Anclam, Prussia, 1871. After receiving a musical education at Stettin, she made her début in New York, taking the rôle of Brünhilde in Wagner's opera. She is popular as a singer in England, having sung at Worcester Festival and at Covent Garden. She was enthusiastically received in America during her concert tour in 1899–00 and her reputation has increased in later years. She is particularly successful in her rendering of Wagner.

JOHANNA GADSKI

Gage, Lyman Judson, American financier and secretary of the treasury in the McKinley administration, was born at De Ruyter, Madison County, N. Y., on June 28, 1836, and was educated at the academy, Rome, N. Y. For a time he had a junior post in an Oneida bank; but in 1855 he went to Chicago, where he became cashier in the Merchants' Loan and Trust Company, and in 1868, entering the service of the First National Bank, he rose to be president of the institution. During the Columbian Exposition he acted as president of the board of directors, and has since been president of the Chicago Bankers' Club, the American Bankers' Association and of the Civic Federation of Chicago. In March, 1897, he became secretary of the United States treasury, but resigned in 1902. He resides in New York.



LYMAN J. GAGE

Gaines Mill, Battle of, one of the famous seven days' battles of McClellan's Peninsular campaign. McClellan had crossed the Chickahominy with a part of his army, leaving Gen. Fitz-John Porter with 35,000 men on the north bank. Here Porter was attacked on June 27, 1862, by the Confederate army, 55,000 strong, under Generals Lee and Stonewall Jackson. After hard fighting all day, the Federals were driven back, and the advantage rested with the Confederates, though the result was not decisive. Porter's loss was nearly 7,000 in killed, wounded and prisoners. The locality is about eight miles northeast of Richmond, Va.

Gainesville, Texas, city and county-seat of Cooke County, sixty-five miles north of Fort Worth. It is important as the center of a stock-raising and agricultural region. Its industries include pressed-brick works, carriage and leather-factories, cotton seed-oil and flour-mills, soap-factories and meat-packing establishments. The city has good schools, several churches and the service of two railroads. Population 7,624.

Gainsborough, Thomas, a noted English landscape-painter, was born in Suffolk, in 1727. When fourteen, he was sent to London to study art. He first established himself in Ipswich, later at Bath and finally at London. He was one of the foundation-members of the Royal Academy in 1768. He died on Aug. 2, 1788. As a portrait-painter he was the only worthy rival of the great Reynolds. In landscape-painting he reached a high rank. See Brock-Arnold's *Gainsborough and Constable.*

Galahad, Sir, in the Arthurian romances, the noblest and purest knight of the Round Table. He was the son of Sir Launcelot of King Arthur's court by marriage with Elaine, the fair daughter of King Pelles, and achieved the honor of winning the Holy Grail, in the quest of which his father and the other knights had failed. The meaning is that Sir Galahad, according to the legend, had been permitted by his sanctity to see the Holy Grail (Sangraal); that is, that he saw not by the eye of faith merely but with his bodily eyes, and touched with his hands the incarnate Savior, reproduced by the consecration of the elements of bread and wine. He therefore takes the "seat perilous" at the banquet of King Arthur and his knights, and becomes king of the Holy City. See Malory's romance of *Morte d' Arthur* and Tennyson's lyric of *Sir Galahad,* his *Elaine* and the *Holy Grail* in the *Idylls of the King.*

Galen (*gā′len*), **Claudius,** a celebrated Greek physician, was born at Pergamus, Mysia, in 130 A. D. He studied medicine at various places, and was physician to the school of gladiators in his native city for six years. He then went to Rome, where he gained a great reputation, attended the emperor Marcus Aurelieus and his two sons and, later, the emperor Severus. Of his works, eighty-three genuine treatises still exist. He gathered all the medical knowledge of his time, and fixed it on such a firm basis of truth that his work continued to be the authority in that science for centuries. He died, probably in Sicily, about 201 A. D.

Galena, Ill., is the county-seat of Jo Daviess County. It was named from the galena, the most important of the lead-ores, found in its vicinity; settled in 1827; and incorporated as a city in 1839. About 1850 it became the western terminal of the first-built section of the present Chicago and Northwestern Railroad. It is also served by the Chicago, Burlington and Quincy Railway. The city, which owns its electric-light plant, has a large trade and is a center of great interests in lead and zinc. Among the other industries are shoemaking and smelting. Galena is famous for having been the home from which Grant entered service in the Civil War. The homestead still is one of Galena's attractions. Others comprise Grant Park, the statue of Grant, the federal custom-house, the government-building and the public library. Population 4,875.

Gale′na, Kan., a thriving city of Cherokee County, southeastern Kansas, on the Kansas City, Fort Scott and Memphis Railroad. It is also reached by the St. Louis and San Francisco Railroad, and is seven miles west of Joplin, Mo. Mining is the chief industry of the region, which is rich in deposits of lead and zinc. The city added some eight thousand to its population in the previous decade, the number of its inhabitants now being 6,096, employment being given to many of them in the town's stamping and smelting works and other industrial activities.

Galesburg, Ill., the capital of Knox County, on four branches of the Chicago, Burlington and Quincy Railroad, also has the service of the Santa Fe, and is 162 miles southwest of Chicago. It is in a rich agricultural region, and near by are also some remunerative coal-mines. It possesses some notable educational institutions, among them Knox College (Congregational, Lombard University (Universalist), etc. It has considerable industries, including machine-shops, foundries, carriage and wagon-works, stockyards and the largest paving-brick manufacturing plant in the world. Population 22,089.

Gal′ilee, one of the four Roman divisions of Palestine. In the time of Christ it included the whole northern portion of Palestine from the Mediterranean to the Jordan. The district was divided into Upper and Lower Galilee, the former being hilly and wooded and the latter level and fertile. At that time it was mainly inhabited by Syrians, Phœnicians, Arabs and Greeks, with a few Jews. It had, therefore, long been known as Galilee of the Gentiles, *i. e.*, of the nations. The principal towns were Tiberias and Sepphoris. Those that figure in the gospels are Cana, Capernaum, Nazareth and Nain. There are still in this region the ruins of many fine synagogues. Galilee now forms part of the division called the pashalic of Damascus, in the Turkish province of Syria. It still has a number of Jewish inhabitants. See Dr. S. Merrill's *Galilee in the Time of Christ.*

Galilee, Sea of, called also Lake of Gennesaret, Sea of Tiberias and Sea of Chinnereth. It is a lake in the northern part of Palestine, lying 626 feet below the sea, and is thirteen miles long by six broad and 820 feet deep. It occupies the bottom of a great basin, and is of volcanic origin. Its waters are cool, clear and sweet, although the red and turbid Jordan and many warm springs find their way into it. Its shores on the east and north are bare and rocky; on the west they slope gradually and are covered with vegetation. It has many sacred associations. On its banks are Bethsaida, Capernaum, Magdala and Tiberias. In the time of Christ the surrounding region was the most densely populated in Galilee; now even its fisheries are almost entirely neglected.

Sir Galahad—*Watts*

His strength was as the strength of ten,
Because his heart was pure.

Galile′o (*găl′ĭ-lē̆′ō*) (usual designation of Galileo Galilei), the founder of modern physics, was born at Pisa, Feb. 18, 1564, and died at Arcetri, near Florence, Jan. 8, 1642. In 1581, at the age of seventeen, he entered the University of Pisa where a brilliant career awaited him, not only in mathematics and mechanics but in literature, eloquence, music and art. From 1592 to 1610 he held a chair of mathematics in the University of Padua. The remainder of his life was mostly spent at Florence. It is easy to recall Galileo's position in time, if we remember that he was born on the day of Michelangelo's death and that he died in the year of Newton's birth.

In popular estimation Galileo has ranked as a great astronomical discoverer, and rightly so; but it is now clear that his chief service to science is the establishment of modern dynamics.

To him we owe a clear statement of the fundamental assumption of physical science, namely, that nature always behaves in the same way in the same circumstances.

To him we owe also the ideas which underlie the first two of Newton's laws of motion. See DYNAMICS.

He first enunciated the correct laws of falling bodies, showing that, if we neglect the resistance of the air, the path of a projectile must be an ellipse. In astronomy he did not invent the telescope, as is so often asserted; but he used this instrument with great skill to discover spots on the sun, measure its rotation-period, discover four of the satellites of Jupiter, observe the phases of Mercury and Venus and find the elongated form of Saturn which Huygens later showed to be due to the planet's rings.

But no astronomical service of Galileo can outrank that which he did in establishing the Copernican system by showing the mechanical principles upon which the solar system is constructed. In 1616 he was warned by the Inquisition not to "hold, teach or defend" the Copernican system, and agreed to act upon their advice. Nevertheless, in 1632, he published his *Dialogue Concerning the Two Great Systems of the Universe*, which proved to be a somewhat disguised yet powerful argument for the Copernican view. As a result he was summoned to Rome in Oct., 1632, where he disavowed his adherence to the heliocentric system. The story which is often told of his recanting and then remarking concerning the earth, as he rose from his knees: "It does move, however!" is a pure fiction of later times.

An English translation of the more important of Galileo's writings is sadly needed.

Gallatin (*găl′lȧ-tĭn*), **Albert,** an American statesman, was born at Geneva, Switzerland, Jan. 29, 1761. He studied in its university, and in 1780 emigrated to America. He served a short time in the Continental army, and taught French for a year at Harvard College. He settled in Pennsylvania, and was naturalized in 1786. He soon entered politics. When the "whiskey insurrection" broke out, Gallatin, at considerable personal risk, helped to bring it to a peaceful close. From 1795 to 1801 he was a member of the house of representatives, and was a recognized leader in his party. He directed his attention especially to financial questions, and under Jefferson and Madison was secretary of the treasury, where his successful management and his writings made him recognized as one of the first financiers of the age. He also took an important part in the negotiations for peace with England in 1814, and signed the treaty of Ghent. He served as minister to France and to England together with other important posts. The latter part of his life was devoted to literature. He made a study of the American Indians, and wrote several works on the subject. He died at Astoria, N. Y., Aug. 12, 1849. See *Life* by Henry Adams.

Galley, a long, narrow rowboat, carrying a sail or two, but depending for safety and movement upon oars. When small, galleys were called galleots and brigantines. An old-time galley was about 150 feet long, and its greatest beam was 20 feet wide. It carried two masts, a mainmast and a foremast, each with a great lateen-sail. There were a short deck at the prow and one at the stern. Between the two were sometimes 54 banks or benches, 27 on a side, occupied on either side by four or five slaves, whose duty was to propel the vessel by means of oars. If a Christian vessel, the rowers were either Turkish or Moorish captives or Christian convicts; if a Barbary corsair, the rowers were Christian prisoners. Sometimes a galley-slave worked as long as twenty years, sometimes all his life, at this onerous calling. Slaves were chained so close together on their narrow bench that they could not sleep at full length. Biscuit was made to last six or eight months, each slave getting 28 ounces three times a week and a spoonful of some mess of bones, rice or green stuff. Between the two lines of rowers ran the bridge, and on it stood two boatswains, armed with long whips with which they scourged the slaves. On a large galley, besides 270 rowers, there was a mixed crew of about 75 men, together with 50 or 60 soldiers; so that the whole equipment of a fighting-galley must have reached about 400 men. A galleas originally was a large, heavy galley, but later it became a sailing ship, as was the galleon of the Spaniards. See S. Lane-Poole's *The Barbary Corsairs.*

Galls, deformities produced on plants by insects, fungi and slime-moulds. One species of insect attacks the root, another leaf, flower or stem. Of insects that cause galls may be mentioned gall-flies, certain caterpillars, a few beetles, certain mites and scale-insects. Eggs are laid in the tissues of the growing plant, and generally the galls appear to form after the egg hatches.

Galt, a town of 9,718 in western Ontario, is called the Manchester of Canada. Grand River flows through it, supplying efficient water-power. Its leading lines of manufacture are machinery of all kinds, edged tools, woolen and knitted goods and flour. The thriving towns of Paris, Ayr, Preston and Hespler are near, and are reached by trolley. It took its name from John Galt, the Scotch novelist, who gave two noteworthy sons to the service of the Dominion.

Galt, Sir Alexander T., was born at Chelsea, England in 1817, educated in England, came to Canada and settled in Montreal. A government director of the Grand Trunk Railway in 1857–8, he proposed resolutions in the Canadian Parliament in favor of a federal union of British North America colonies in 1858. These resolutions became the basis of the policy of the government which he joined that year under Sir George E. Cartier. With Sir George E. Cartier and the Hon. John Ross he went as a delegate to England to urge the imperial government to sanction federation and the construction of the Intercolonial Railway; was minister of finance from 1858 to 1862, and a second time from 1864 to 1866. He was a delegate to Washington respecting the renewal of the reciprocity treaty, 1866–7, and was a member of the fisheries commission appointed under the treaty of Washington which sat at Halifax in 1877. He conducted negotiations on behalf of Canada for a commercial treaty with France and Spain, 1879, and was High Commissioner for Canada in England, 1880 to 1883. He is styled one of the fathers of federation.

Gal′ton, Francis, an eminent English scientist, was born near Birmingham in 1822. He graduated from Trinity College, Cambridge, in 1844. He travelled in 1846–1847 in the Sudan, and in 1850 entered upon a thorough exploration of part of the southwest of Africa. On his return to England Galton published the narrative of his explorations. He next turned his attention to meteorology; and to him are due both the theory of cyclones and anticyclones and the device of weather-maps. Galton is greatest as a student of human heredity. In his *English Men of Science*, *Hereditary Genius*, *Inquiries into Human Faculties*, *History of Twins* etc. he made studies, some of them quantitative, which led him to set the greatest emphasis upon heredity and to attribute less importance to ordinary differences in nurture than was previously done. He also published two papers on finger-prints. Galton has made the methods of statistics and the *questionnaire* popular among modern scientific students.

Galuppi (*gȧ-lo͞op′pē*), **Baldassare** (1706–1784). Italian composer of operas and harpsichord-music; chapel-master at St. Mark's, Venice, and director of the Incurabili, one of the four renowned conservatories of Venice. Robert Browning has introduced him in his poem, *A Toccata of Galuppi's*.

Galvani (*gȧl-vä′nē*), **Luigi,** an Italian surgeon, distinguished especially for his electrical discoveries He was born at Bologna on Sept. 9, 1737, and died on Dec. 4, 1798. From 1775 he was professor of anatomy in Bologna. In 1780 he observed that frogs' legs, when skinned and supported on hooks of two different metals in contact, begin to twitch. He recognized in this the electrical effect of a battery composed of two metals and the moist frogs' legs. In 1786 he studied the effect of atmospheric electricity in stimulating the nerves of the frog's leg. The frog's leg, thus used, is indeed the earliest galvanometer of which we have any account.

Gal′vanom′eter, an electrical instrument, employed to detect the presence of an electrical current and sometimes to measure the intensity of the current. More than nine tenths of all the galvanometers in use depend upon the fact that a conductor conveying an electric current is surrounded by a magnetic field. (See Electricity.) Up to the last quarter of the 19th century currents were very frequently measured by their electrolytic effects and sometimes by their heating effects. Edison has devised a commercial current-meter which measures the current by measuring the amount of zinc which the current will remove from one zinc-electrode and deposit on another. Major Garden has invented a galvanometer for measuring electromotive forces, which depends upon the fact that the larger the current the hotter and longer the conductor. But these two instruments are not widely used. Galvanometers of the magnetic type are of two different kinds. In one the conductor is bent into a circular coil of wire, in the middle of which is suspended a small magnet. The magnet, when not acted upon by any moment of force, will set itself in the plane of the earth's magnetic meridian or in the direction of any artificial field which may be placed about it. If a current be passed through the coil of wire which has been placed in the plane of the magnetic field, the magnetic field will be changed and the suspended magnet will turn on its axis, thus indicating the presence of the current. This form of instrument has been brought to great perfection through the efforts of Lord Kelvin and, later, of

Dr. F. Paschen of Germany. The other kind of galvanometer, which depends also upon the magnetic effect of the current, is one in which the magnet is fixed and the conductor so suspended as to rotate between the poles of the magnet. The position of equilibrium of the coil is such as to include no lines of force. When a current passes, the coil sets itself so as to include the greatest possible number of lines of magnetic force and thus indicates the presence of the current. This type of instrument was perfected by Kelvin and by D'Arsonval. It is generally known as the D'Arsonval galvanometer.

Very perfect galvanometers of this type, so graded as to read the current directly in ampères, are made by Weston of Newark, N. J.

Sometimes a combination of these two kinds is employed. Instead of a suspended magnet a suspended coil is employed, while the magnetic field in which this coil swings is produced by the current which is to be measured. In other words, a movable coil is suspended in the field of a fixed coil. This tpye of instrument was invented by Weber, and used to be called an electro-dynamo meter, but has been brought to a high degree of perfection by Kelvin in his ampère-balance.

A galvanometer, which has in it a resistance which is high compared with other parts of the circuit is called a voltmeter, because its readings are proportional to the voltage between the terminals of the circuit to which it is applied.

Gal'veston, in southeastern Texas, has an interest and importance exceeding that of any other city of the same size in the United States. Its special claim to distinction lies in the energy of its citizens in wresting prosperity out of unparalleled disaster and, at the same time, initiating the business-corporation form of municipal government known widely as the Galveston plan. The situation of the city on Galveston Bay, which is 35 by 15 miles, gives it the best natural harbor on the Gulf of Mexico and makes of it a seaport second only to New Orleans. Its further growth must keep pace with the development of the great southwest. It had the disadvantage of lying on an island which, although 30 miles long by three wide, rose but a few feet above the level of the Gulf and was occasionally flooded. Proper paving and drainage were impossible. Lying in the same latitude as St. Augustine, Florida, its climate is subtropical. Groves of oleander and orange gave it beauty; but cholera and yellow fever were accepted as inevitable, as was corruption in the municipal government. It was a wide-open, slatternly, unhealthy town, but no one thought of changing anything, for business flourished with the enormous shipments of cotton, wheat, lumber, tallow and hides, and life, if precarious, was easy and luxurious.

On the 8th of September, 1900, the city was almost destroyed by a cyclone and tidal wave. One sixth of the population was drowned and one third of the property destroyed. The rotten cedar-block pavements floated off in rafts, laying bare the original sand. The treasury was empty, credit was gone, taxes could not be assessed on property that had ceased to exist. Thousands were fleeing the stricken city and, in the hour of extremity, the municipal government broke down. But that ill-wind had blown away indifference, greed and moral miasma. Out of the disaster sprang such energy, ability and civic patriotism as the world has rarely witnessed. The work to be done needed new, clean tools. The city was looked upon as a ruined business, and a business-corporation government was devised to build it up again.

A special act of the legislature abolished the mayor and council and created a board of directors or commissioners of five members, one of whom is president, all being elected by popular vote. Salaries were nominal, for the commissioners were simply the responsible heads of departments with well-paid, expert managers under them to carry out the details. The same kind of men of independent means, position and reputation were secured as now serve for nothing on library, park and school boards in other cities. One commissioner was at the head of finance and revenue—a banker with an expert accountant, employed as city auditor, under him; one had charge of water-works and sewage, with a civil engineer; one of fire and police; and one of streets and public property.

A new city occupies the old site. Galveston has build a sea-wall four and a half miles long and seventeen feet high, and raised the grade of the city to its top. It has paved the business-section with brick and installed a sewerage system; drained the swamps; stamped out epidemics; and cleaned the town morally. In spite of this monumental work municipal expenses have been cut one third. The credit of the city is above par. The population has been about restored, and the business has increased. Dallas and Houston have adopted the Galveston plan, and cities all over the country are watching the experiment with interest. Population 36,981.

Gama (*gä'mä*), **Vasco da,** the greatest of Portuguese navigators, was born about 1469 at Sines, a small seaport in the province of Alemtejo. He early distinguished himself as a brave mariner. When the voyage of Diaz around the Cape of Good

Hope caused the Portuguese to determine on further explorations, Gama was chosen to command an expedition of four vessels, manned with 160 men. Furnished with letters to all the potentates he was likely to meet, among them the fabled Prester John, then supposed to be reigning in splendor somewhere in the east of Africa, he set sail on July 8, 1497, from Lisbon. Vexed by storms, he was four months in reaching St. Helena Bay, and after rounding the Cape, in the midst of storms without and mutinies among his crew, he made Melinda early in the following year. Here, finding a skillful Indian pilot, he steered eastward across the Indian Ocean and arrived at Calicut, India on May 20, 1498. The ruler of Calicut, at first suspicious, soon became hostile, and Gama had to fight his way out of the harbor. He reached Lisbon in September, 1499, was received with great distinction, and created a noble. Three years later Gama was sent to avenge the massacre of a Portuguese colony at Calicut. He bombarded Calicut, destroyed a fleet of 29 ships, extorted a favorable peace, and founded the colonies of Mozambique and Sofala; but the cruelties inflicted in this expedition left an indelible stain upon his name. After 20 years of retirement at Evora, Gama was again sent to the scene of his triumphs, as viceroy of the Portuguese dominions in India; and, while engaged there in successful work, he died at Cochin in December, 1524. His body was taken to Portugal and buried with great pomp. The great achievement of Gama is probably only second in importance to the voyage of Columbus a few years before. His story gave rise to the *Lusiad* of Camoens. See *The Three Voyages of Vasco da Gama*, translated by Lord Stanley of Alderley.

LÉON GAMBETTA

Gambetta (*gǎm-bět'tȧ*), **Léon Michel,** a French statesman, was born at Cahors, Oct. 30, 1838. He became a lawyer at Paris, and soon attracted attention. Upon the surrender of Napoleon III at Sedan in 1870, Gambetta proposed to dissolve the empire, and he was one of the first to proclaim the republic on Sept. 4. When the government of national defense was formed, he became minister of the interior, and at once took active measures for opposing the Germans and defending Paris. He escaped from the city in a balloon, and took the general conduct of public affairs, being for five months dictator of France. With marvelous energy and undaunted courage, he called into existence army after army and sent them against the German hosts; but in vain. He continued the contest even after Paris had surrendered, and refused to agree with the action of his colleagues in the capital. He finally resigned, and retired for a short time to Spain, but be became more popular than ever with the masses, and was elected to the national assembly by the different departments. After the fall of the short-lived commune Gambetta became the most prominent Frenchman of his time, and played an important part in firmly establishing the republic. Though the most powerful statesman in France, he refused for some time to take office, but later he became president of the chamber and, in November, 1880, premier. He resigned in 1882 after the rejection of his plan for the revision of the constitution, and afterward took little part in public affairs. On Nov. 26 of that year, as he was handling a revolver, it accidentally went off, inflicting a slight wound in the hand, from which, however, he died on Dec. 31, being only 44 years old.

Gam'bia, a river of western Africa, the more southerly of the two great streams of Senegambia. It enters the Atlantic after a course estimated at over 1,400 miles, by an estuary which in some parts measures nearly 27 miles, but contracts at the mouth to little more than two miles. From June to November it is navigable for vessels for about 400 miles. The lower part of the river overflows its banks in the rainy season, and like the Nile leaves a fertile coating of mud.

Gambia, a British colony and protectorate in West Africa on the river of the same name, is situated between Senegal and French Guinea. Area, independent of the adjacent protected territories, 4 square miles; population 13,456. The colony and protectorate have an area of 3,061 square miles and a population of 163,718. The whole colony, with the exception of the island of St. Mary (area 4 square miles, population 8,807), is conducted on the protectorate system. Bathurst is the capital of the island of St. Mary; population 6,000. There are no local telegraphs or railways, but there is a short telephone line at Bathurst, a tramway is in contemplation, and there are cable lines from Bathurst to St. Vincent and Sierra Leone. There are six elementary schools (with over 1,000 pupils), government-aided, besides the Wesleyans' technical school and secondary school. The chief exports are groundnuts, beeswax, hides, rice, millet, sweet potatoes, cotton and rubber.

Games. Modern psychologists have come to regard play as one of the most important activities. The Puritanic notion that the play-spirit is something to be crushed out and even the ordinary view that games may be tolerated only when not positively injurious to body or morals and when kept within proper limits of time and expense have given place to the belief that here we find an indispensable human occupation. Play is by many regarded as synonymous with rest or recreation, and as quite as important as sleep to relieve the fatigue caused by close application to one task. This view doubtless is correct, and it constitutes an important guide to practice.

A second theory is that advanced by the poet, Schiller, and the philosopher, Herbert Spencer. According to them, play is an activity by which the surplus energy of the body is dissipated. We play because we have energy that must be used, and if work does not consume it, play is inevitable. This theory also is part of the truth about play. It does not, however, account for the fact that children play when they are tired or sick.

A third theory, that of the German philosopher, Professor Gross, seems the most complete and significant of all. According to it, play is simply the manifestation of instinctive activities on occasions when something stimulates them, although, owing to the immaturity of the players or the character of the situations, no serious immediate result is possible or desirable. This theory accounts for the form of animal play, for it is that of the instincts of the species. The puppy plays at fighting, at pursuing its prey or fleeing from its enemies. The kid leaps as if on a mountain-side, and the colt flees as from a pursuer and kicks. The practice that the animal gets through these activities matures and perfects its instincts. Play, therefore, is its method of development, its education.

With human beings it is not quite so evident that play is the manifestation of instincts. For the instincts of the child, although very numerous, also are very imperfect, *i. e.*, they require much training and experience in order to be developed to efficiency. Hence, before they are cultivated, they apparently are so useless that one would hardly recognize them as instincts at all. The hereditary element in the child's activity is very early modified by imitation and other forms of external control. Nevertheless, it is of the utmost importance, for without the instinctive tendencies there could be no development. They, in fact, constitute the powers or capacities of the child, and they reveal those interests (*q.v.*) in the direction of which all learning must proceed. During the first four or five years of a child's life the larger part of its learning comes through its play. Very early this takes the form of games largely adopted from other children, but each excellent, in that it affords a fine opportunity for the utilization and control of the instincts: fear, anger, sociability, shyness, affection, jealousy and envy, rivalry, sympathy, constructiveness, secretiveness, acquisitiveness, fondness for organization and government, for rhythm and beauty and for expression.

The play of children begins with mere impulsive activity; wiggling, grasping and handling things, throwing them about, climbing, running etc. Through this the child gains control of its body and becomes familiar with the simpler properties of common things. This knowledge and power are enlarged by the destructive and constructive sport that begins to interest children after the first year. Later, control is perfected under the influence of rivalry, when the play activity takes the form of the performance of physical or, perhaps, mental feats. In all these sports, with the possible exception of the last, the child does not need the active co-operation of others. The games in which such co-operation is necessary are especially numerous and important in the development of the child. Springing from fellowship in any pleasant activity like running, throwing balls or peek-a-boo, they expand into games involving organization or rhythm or both. Here we find the ring-games, the forms of which number hundreds, perhaps thousands. They usually make use of rhythmical movement and often verse or song. With very young children their interest is almost entirely that of activity, novelty, rhythm, harmony and social intercourse. Later, they involve some competition, especially in the form of seeking the favor of other children or older persons. With children of ten these simpler interests have developed into the fiercer joys of intense rivalry. The games become contests, where individuals or sides struggle for supremacy in strength, speed, skill or cunning. Of these the most important and elaborate are the various kinds of ball.

With man the social training afforded by the game may be said to overshadow that in bodily control and in knowledge. Through this activity the child learns the fine art of getting on with his fellows, how to co-operate, how to influence, how to lead, when to submit, when to seek help, when to resist, when to command, manners, customs, morals. In a word. the game socializes the child, and, since it is through social co-operation that man lives, this activity is a fundamentally important one educationally. With primitive races the festival, with its games, has been the principal agency for social intercourse on a large scale. Games were used to celebrate and cement alliances. They were early associated with religious observances, both having the same social and ethical function. From them sprang choral song, tragedy and comedy. Indeed, Schiller regarded the art-impulse as essentially the outgrowth of the tendency to play. Especially with social peoples like the Greeks has the game been allowed a great part in the life both of adult and child. With them it was the principal form of education.

The growth of a mass of learning which it was felt necessary to teach the young involved the substitution of the confinement and restraint of hard work for the freedom and spontaneity of play. This change in educational method was promoted by Christianity, which substituted the ideals of individual salvation and other-worldliness for that of racial and national prosperity and happiness. Asceticism despised the game as pleasant, and glorified the life of the hermit. In modern times the game has again received recognition as a most valuable educational agency, because of the emphasis thrown on the importance of interest (*q.v.*) and the fact that play affords the teacher a chance to introduce a living motive for learning what the school has to teach (see TEACHING, METHOD OF). Basedow (1723-1790) and Froebel (1782-1832) among educational reformers may be said to have done most to resurrect the game and give it a place in education. The latter was, of course, interested most in little children, but modern educators see that the use of the game in the school-room need not be confined to them. Indeed, reformers like Professor Dewey suggest that the life of the school may best take the form of social or group-activity in what may properly be called games. From this problems may be caused to spring, the solution of which may involve all the learning that the school desires to give. Reading, writing, arithmetic, science, history etc. as well as music, art and physical culture may thus be learned through the game. Even though not all school-life may be thus organized, it is recognized that the game may occasionally offer a very effective means of instruction. Finally, educators now realize the great importance of supervision of the play-ground sports of children (see PLAYGROUNDS). For, while the game is the greatest school of social aptitude, it may corrupt as well as build up character. Children need to be taught how to play as well as how to work. Such instruction to be effective must, however, be given in so tactful a way as not to destroy the spontaneity of the game. See CHILD STUDY, INTEREST, METHOD OF TEACHING, PLAYGROUNDS. Consult Gross: *The Play of Animals* and *The Play of Man*, published by Appleton & Co. E. N. HENDERSON.

Gametangium (*găm'ē-tăn'jĭ-ŭm*) (in plants) the organ in which the gametes or sexual cells are formed. Usually, it is applied only in case the gametes are alike in appearance and cannot be distinguished as male and female. In reality, however, the antheridium, oögonium and archegonium are all gametangia. See GAMETES.

Gamet'es, the sexual cells of plants, which fuse in pairs to form the oöspores or fertilized eggs. In the lower plants gametes are alike in size and activity, but in higher plants they become unlike. One kind remains small, usually has cilia, can swim actively and is known as the male cell or sperm (spermatozoid, antherozoid). The other kind becomes relatively very large, has no cilia and remains motionless, and is known as the female cell or egg (oösphere).

Gametophyte (*găm'ē-tō-fīt'*) (in plants), in alternation of generations (which see), the phase of the plant or generation which bears the sex-organs, that is, produces the gametes. In the mosses the gametophyte is the leafy plant, the most conspicuous part; in the ferns it is a very small, prostrate, heart-shaped body which is not usually seen; while in the flowering plants it is concealed from ordinary observation, although the endosperm of most seeds is part of a female gametophyte, that is, a gametophyte which produces the egg.

Gam'opet'alous Flowers, those in which the petals are more or less coalescent. Now mostly replaced by the word sympetalous, which see.

Gando (*găn'dō*) in western Sudan once an independent sultanate but now partly a British and partly a French possession, is on the upper Niger near the Sahara. It is inhabited chiefly by the Fulah, and is an exceedingly fertile region, the rainfall being abundant. The population is estimated at 5,000,000, and their religion is Mohammedanism.

Ganges (*găn'jēz*), the great river of northern India, rises in Gahrwal, on the southern slope of the Himalaya Mountains, issuing under the name of the Bhagirathi from an ice-cave 13,800 feet above the level of the sea. Its general course is southeasterly. At Allahabad it is joined by the Jumna, and farther down by the Son, Gandak and Kusi. At a distance of 220 miles in a straight line from the Bay of Bengal it begins to throw out the branches which inclose the level delta. The main channel, called the Padma or Padda, joins the Brahmaputra, and between this, the most easterly, and the Hugli, the most westerly mouth, lies the delta, with a multitude of mouths and channels. The

Ganges has a total length of 1,157 miles; its drainage-basin embraces over 390,000 square miles, lying between the Himalaya and Vindhya ranges and extending east to the mountains which separate Burma from Bengal. It in some sense is navigable from the point where it enters the lowlands to its mouth; its stream never fails in the hottest summer, and its floods distribute over the fields a rich top-dressing of soil. The Ganges is the most sacred river of India; from its source down to the sea every foot of Mother Ganges' course is holy. To bathe in her waters, according to the Brahman creed, will wash away sin; to die and be buried on her banks secures free entry to eternal bliss. Gangotri, Hardwar, Allahabad, Benares and Sugar Island, the most sacred spots, are visited by thousands of pilgrims every year. So potent is the religious influence of this stream that those who exclaim "Ganga, Ganga," even at a distance of a hundred leagues, atone for the sins committed during three previous lives.

Ganymede (*gan'i-mēd*), the cupbearer of Zeus, was, according to Homer, the son of King Tros. The most beautiful of mortals, he attracted the notice of the king of the gods, who determined to make him his cup bearer, to succeed Hebe, and so sent his eagle to carry him off to heaven. Zeus gave Tros a pair of divine horses to make up for his loss, and comforted him by telling him that Ganymede was now immortal. Ganymede was later believed to be the same god that presided over the Nile. The Greeks placed him among the stars, under the name of Aquarius or the water-bearer. Ganymede was a favorite subject of ancient art, and to some extent is a favorite also of modern art.

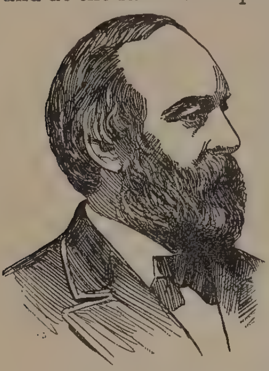
Gapon, George, a Russian socialist and priest, was born in Biliki, Poltava, in southern Russia. As a boy he lived with his peasant parents, tending the sheep and cattle. At the age of twelve, he entered the lower Ecclesiastical School in Poltava. There he commenced to be influenced by the writings of Tolstoi. At sixteen he passed into the Ecclesiastical Seminary. For a few years following he taught in Poltava and there became ordained to the priesthood. Two years later he entered the Ecclesiastical Academy in St. Petersburg. About 1904 he formed a society called The Gathering of Russian Factory Hands of St. Petersburg. This was gradually enlarged, until it became a powerful band of socialists. Father Gapon led the Russians in their appeal to the czar in 1905, when he was shot. He was found hanged in April, 1906, in a country-home of Mme. Zverzhinskaia, in Oxorkow, Russia.

Garcia (*gär-thē'ä* or *gär-sē'ä*), **Calixto,** a Cuban insurgent-general, was born at Holguin, Cuba, Oct. 14, 1836, and died at Washington, D. C., Dec. 11, 1898. When the Ten Years' War broke out in 1868 under Céspedes, he joined the insurgents and rose to the rank of major-general. In 1873 he and his command were surprised by the Spanish forces and captured. Rather than surrender, Garcia placed the muzzle of his revolver beneath his chin and fired his last shot. The bullet came out between his eyes, but, though it marked him for life, did not kill him. After a long imprisonment in Spain he was pardoned and released, returning secretly to Cuba in September, 1895, when the new revolt occurred. In Cuba he coöperated with Gomez in the department of the East, and during the siege of Santiago by the United States forces he coöperated with General Shafter. In December, 1898, he was appointed head of a commission elected by the Cuban Assembly to visit Washington and confer with the United States authorities as to the future of Cuba. While at Washington, he died of an attack of pneumonia.

Gard'iner, Samuel Rawson, a modern English historian, was born in Hampshire, England, March 4, 1829. He was educated at Winchester and at Christ Church, Oxford, and for some years was professor of modern history at King's College, London. In 1885 he resigned his post to devote himself to writing. He has made a thorough study of the period of the first two Stuart kings in English history, and is the authority for that period. Besides his history of that period, he has also written a number of shorter works, among them *The Thirty Years' War* and *Introduction to the Study of English History*. His more ambitious works are *The Personal Government of Charles I; The Fall of the Monarchy of Charles I; History of the Great Civil War;* and *Constitutional Documents of the Puritan Revolution.*

Gard'ner, a town in Worcester County, Mass., 25 miles north of Worcester. It is the center of a large agricultural region, but is most important for its immense chair-factory. This establishment employs about 3,000 people, and manufactures almost every kind of chair. The town has two parks, a public library, an almshouse and a home for the aged. It is served by the Fitchburg division of the Boston and Maine Railroad, two branches of which go through the town. Population 14,699.

Gar'field, James Abram, the twentieth president of the United States, was born at Orange, Cuyahoga County, O., Nov. 19, 1831. His father died soon after his birth, and his early life was spent in poverty. He worked on a farm, and for three months was a canal boatman. He attended and taught in the public schools, studied at Hiram College, and finally graduated at Williams College in 1856 with high honors. The next



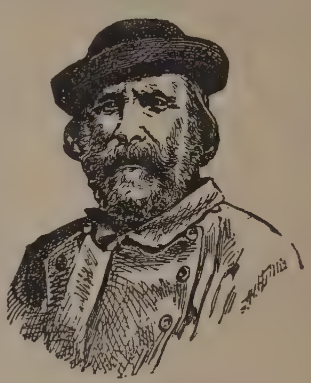
JAMES A. GARFIELD

year he became president of Hiram College, and at the same time preached and studied law. He was elected to the state senate in 1859, and on the outbreak of the Civil War he became colonel of the 42d Ohio volunteers. For gallantry he was made brigadier-general, being the youngest of that rank in the service. He served at Shiloh and at Corinth, and in Alabama was appointed chief of staff of the Army of the Cumberland, and, again for gallantry at the battle of Chickamauga, was made a major-general of volunteers. He resigned shortly after to enter Congress, at thirty-two, where he remained until 1880, being, after the removal of Mr. Blaine to the senate in 1876, the recognized leader of the Republican side of the house. In 1880 he was elected a United States senator, nominated for the presidency at Chicago, and elected by the votes of nearly all the northern states. On July 2, 1881, four months after his inauguration, he was shot in the depot of the Baltimore and Ohio Railroad in Washington, by Charles Guiteau, a disappointed office-seeker. For months he lingered between life and death, and at last died on Sept. 19, 1881, at Elberon, N. J., where he had been taken in the hope of saving his life. Funeral services were held over his remains in the rotunda of the capitol, and he was buried at Cleveland, O. See *Life* by J. R. Gilmore.

Garfield, James Rudolph, born in Ohio in 1865, is a son of President Garfield. He studied law at Columbia, after graduating from Williams College. In 1896 he became a Republican member of the senate of Ohio. Since 1903 Mr. Garfield has been the Commissioner of Corporations in the Department of Commerce and Labor, and has discharged the trying duties of his office with great ability.

Garibaldi (*găr′ĭ-bal′dĭ*), **Giuseppe,** an Italian patriot, was born at Nice, July 4, 1807. Beginning his career as a sailor, his voyages filled him with that democratic ardor which marked his whole life. In 1834 he was concerned in the Young Italy movement of Mazzini, and was condemned to death, but escaped and went to South America. Here he assisted the province of Rio Grande in its rebellion against the emperor of Brazil, distinguished himself as a guerrilla and privateer, and married a beautiful creole who became the companion of his early campaigns. After various adventures he entered the service of the Montevideans.

In 1848 he returned to his native country, and entered with ardor into the struggle for Italian independence. He won fresh laurels as a leader, but in the following year was compelled to leave Italy. He came to the United States, where he remained till 1854. He then once more sought Italy, and in 1859 the outbreak of the war of Italian liberation called him again to arms. He placed his sword at the disposal of Victor Emanuel, and though much hampered by conflicting parties, he and his Red Shirts, as his men were called, won many victories. He freed Naples and Sicily from the Bourbons and turned them over to Victor Emanuel. But in an attack on Rome he was wounded and captured. Soon after he made a journey to England, on behalf of Denmark, and was received with the wildest enthusiasm. In the Austro-Prussian War of 1866 he once more figured, and in another attack on Rome was captured, but escaped in a boat to Caprera, his island home. He came to the assistance of the French republic in its struggle with Germany, and was elected to the national French assembly.



GIUSEPPE GARIBALDI

During the latter part of his life he remained a helpless invalid at Caprera, except when he came forth to take his seat in the chamber of deputies at Rome. He died on June 2, 1882. Though Garibaldi made many mistakes, his patriotism is undoubted, and he will always remain a central figure in the story of Italian independence. See J. T. Brent's *Life of Garibaldi*.

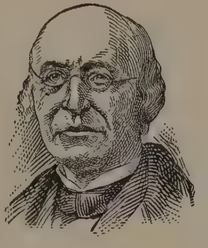
Gar′land, Hamlin, American novelist and short-story writer, was born at West Salem in the La Crosse valley, Wis., Sept. 16, 1861, and was educated in Iowa and in Boston, Mass. Until 1881 he worked on his father's farm, spent some time in Dakota, then proceeded east, where he taught English literature in private schools in Boston and its neighborhood, and published his first book in 1890. Since then he has devoted himself to lecturing and writing. Besides a collection of verse, entitled *Prairie Songs*, he has published *Rose of Dutcher's Coolly; A Member of the Third House;*

Main Traveled Roads; Wayside Courtships; Prairie Folks; Ulysses Grant: His Life and Character; The Trial of the Gold-Seekers; and *Boy-Life on the Prairie.*

Garnet, a mineral found distributed in crystals through many crystalline rocks. The commonest form are crystals of 12 or 24 sides, and the commonest color is some shade of red, but brown, yellow, green and black varieties are known. All garnets contain much silica; in fact, they are silicates; the others' constituents vary, and they are divided into a number of groups, according to what they contain. Among the best-known kinds are alumina-lime garnets, alumina-iron garnets, lime-iron garnets, etc. They also have popular names, as cinnamon-store, oriental garnet, common garnet. The garnets of commerce are brought from Bohemia, Ceylon, Peru and Brazil; and the most esteemed kinds are commonly called Syrian garnets. The stones vary in size from the smallest that can be worked to the size of a hazelnut. Larger ones usually have flaws or impurities.

Garonne (*gä'rōn'*), the principal river in the southwest of France, rises within the Spanish frontier in the Pyrenees, 6,142 feet above the sea. Flowing in a general northwesterly direction, it is joined by several tributaries, and widening into the estuary which bears the name of the Gironde, about 50 miles long, enters the Atlantic at Pointe de Grave. The total length is about 346 miles, and it drains an area of some 22,020 square miles. Ocean-steamers go up the river as far as Bordeaux and small craft as far as Cazeres. At Toulouse it is joined by the Central Canal, which, running eastward to the Mediterranean, forms with the Garonne a means of communication between that sea and the Atlantic. The valley of the Garonne is noted for its beauty.

Gar'rick, David, a celebrated British actor and dramatist, was born at Hereford, England, Feb. 20, 1717. He studied for a few months under Samuel Johnson, and in 1737 master and pupil set out for London. After some preparation Garrick made his appearance as an actor in 1741. At first he played minor parts, but his success as Richard III was so great that the other theaters were deserted. In 1747 he became manager of Drury Lane theater, which he continued to direct till 1776, when he retired from the stage. During this period Garrick was the great attraction and played continually, his only rest being a trip to the Continent. He died on Jan. 20, 1779, and was buried in Westminster Abbey. As an actor Garrick occupies the first rank. He found the stage given over to formality and tradition, and in their place he left the impress of his own naturalness. He was equally at home in tragedy, comedy and farce. His dramatic productions are of little value. See Percy Fitzgerald's *Life of Garrick.*



WM. L. GARRISON

Gar'rison, William Lloyd, an American journalist and abolitionist, was born at Newburyport, Mass., Dec. 10, 1805. After trying shoemaking and cabinet-making, he became a printer on the Newburyport *Herald*, and when only 16 began to write for the newspapers, trying to arouse an interest in the slavery-question. In 1824 he became editor of the *Herald* and accepted some of Whittier's earliest poems, when their author was yet unknown to fame. Later he became editor of the *Genius of Universal Emancipation* at Baltimore, and was imprisoned for his outspoken antislavery views. In 1831 he founded *The Liberator* in Boston, without capital or subscribers, a paper which he carried on until slavery was abolished. He was threatened with imprisonment and even with assassination, and a mob severely handled him in Boston in 1835, but he kept to his purpose. He made several visits to England in the interest of the cause he had taken up, and in 1833 he organized the American antislavery society, of which he was afterwards president. He continued his newspaper during the Civil War, and discontinued it in 1865, when the amendment to the constitution prohibiting slavery in the United States was adopted. The same year a number of his friends presented him with $30,000 as a memorial of his services. He died at New York, May 24, 1879. See *Life* by Johnson.

Gar'ter, Order of the, the highest British order of knighthood, was originated by Edward III, probably on Jan. 18, 1344, to reward his most distinguished comrades in arms in his struggle with France. The story is told that the king was dancing with the countess of Salisbury, and when she happened to drop her garter, he picked it up and presented it to her, saying at the same time, in French, with reference to those who smiled at the action: "Dishonored be he who thinks ill of it," which became the motto of the order. It was founded in honor of the Holy Trinity, the Virgin Mary, St. George of Cappadocia and St. Edward the Confessor, but St. George is always accounted its special patron. The habit and badges of the order are the garter of dark-blue velvet, edged with gold, bearing the motto in golden letters, worn on the leg below the left knee; the mantle; the hood; the surcoat or gown; the hat; the plume; the golden collar; the George, a figure of St. George on horseback meeting the dragon; the star; and the ribbon. The order consists of the sovereign and 25 knights and such descendants of George II as shall be elected, besides distinguished foreigners. The Prince of Wales, son of the ruling sovereign, is always a member. The members write the title K. G., Knight of the Garter, after their names. See Sir Harris Nicolas' *History of British Orders of Knighthood.*

Gary, Ind., about 22 miles southeast of Chicago on Lake Michigan, was established by the U. S. Steel Corporation in 1906 in connection with the location of the largest plant in the west. Within two years what had been sand dunes and swamp was occupied by a modern well-built city of several thousand inhabitants with a modern school system worked out on such original and practical lines that it was known throughout the country. Population about 20,000. See SCHOOL SYSTEM AT GARY.

Gas, a term applied to a vapor which cannot be condensed to a liquid at ordinary temperatures and pressures. Thus, in the ordinary conditions of the atmosphere, air is a gas, and other gases are oxygen, hydrogen, nitrogen etc. Gases have small densities as compared with liquids and solids; air, which is about 14 times as dense as hydrogen, is only about $\frac{1}{800}$ as dense as water. Gases have no definite surface boundary, but occupy any space within which they may be confined. With a given quantity of gas, the smaller the containing vessel the greater the pressure exerted on its walls; and it is true, for all practical purposes, that twice a given pressure reduces a given volume one half. If two gases be brought together, they will gradually mix with one another, even though the mixing has to take place in opposition to gravity. Thus, if a bottle of carbonic acid be connected by even a slender tube with a bottle of hydrogen placed above it, some of the heavy carbonic acid will make its way into the upper bottle, and a corresponding volume of the light hydrogen will descend into the lower, and within a few days the two gases will be completely mixed. The same thing will result even if the two gases be separated by a thin membrane or a piece of unglazed porcelain. Gases may, in many cases, be dissolved in liquids, as ammonia and carbonic-acid gas.

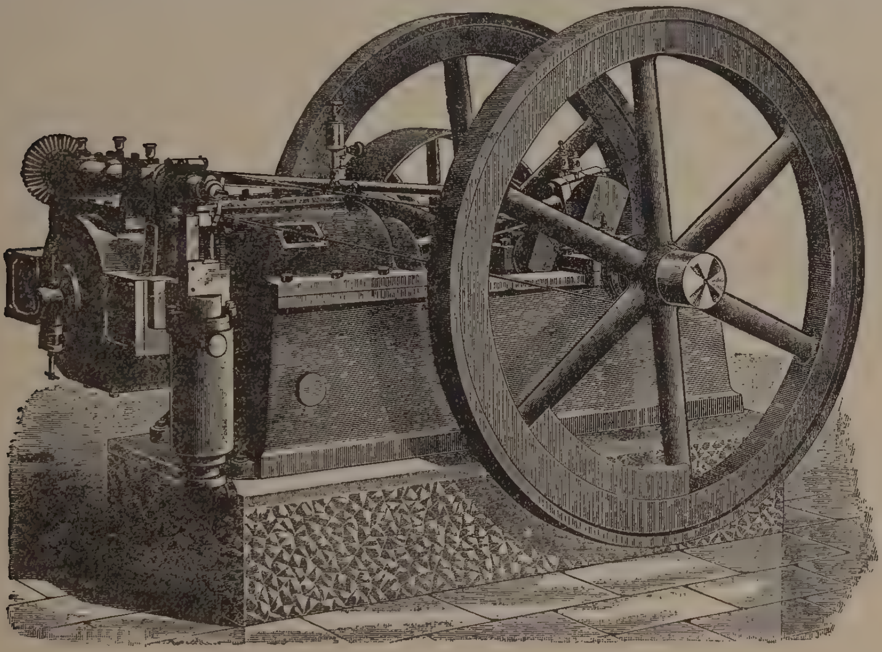
Of gases used for lighting or heating, there are various kinds. The most common kind is coal-gas, made from bituminous or soft coal. The principle of the manufacture of coal gas may be seen in the following experiment: Powder a little coal and put it into the bowl of a common, long tobacco-pipe; then cover the top with moist clay, let it dry, and then heat the bowl. Soon there will come out at the end of the pipe a yellow smoke, which is coal-gas, and this will burn when a light is brought to it; in the pipe is left some coke or carbon. In manufacturing this gas, instead of tobacco pipes, large ovens of brick or iron are used, called retorts. Large works may have a hundred furnaces, each of which has from five to ten retorts. The gas is purified by various processes from the other products of the coal, as tar and ammonia.

Other kinds of lighting gases are oil-gas, made from heavy mineral oils or, as in Australia, from waste mutton-fat, and used sometimes to light railroad-cars and steamships; water-gas, made by passing steam through glowing coke; wood-gas and peat-gas. Besides these artificial gases, an important gas, both for heating and lighting, is natural gas, which issues from the earth in many places. This gas has long been used in China, and near the Caspian Sea there are several so-called eternal fires which are supported by gas escaping from the soil. But it is chiefly in North America that natural gas has been found and used. It came into notice in connection with the digging of oil-wells, and was for a long time looked upon as a disadvantage. The general use of it for burning began only in 1872 in Pennsylvania. Many of the gas-wells lasted only four or five years, but some then sunk are still in use. Two years later manufactories began to use it, and one smelting company now uses a million cubic feet every hour. Natural gas is also found in Ohio, Indiana, Kentucky, Kansas, Dakota and (slightly) in California. It is believed by many that it will soon be exhausted. See Miller's *Chemical Physics.* See NATURAL GAS.

Gas-Engine, an engine driven by the force produced by the explosion of a mixture of air and a gas. A gas-engine is a form of internal-combustion engines, because the fuel, the gas, is burnt in the cylinder of the engine. The first gas-engine used practically was that of Lenoir (1860). Air and gas were drawn into the cylinder in suitable proportions, and, as soon as the inlet-valve was closed, the mixture was exploded by an electric spark. The cylinder was kept cool by a water-jacket. The engine was not economical. It used from four to five times as much as a good modern gas-engine. In 1866 Otto and Langen invented a gas-engine which used only about half the gas that Lenoir's engine did. The explosion occurred in a vertical cylinder under a piston which was driven up. The piston then came down under atmospheric pressure, and was in gear with the shaft only during the down stroke, so that the work was done only on the down stroke. It was very noisy and did not come into general use. In 1876

Otto brought out the present four-stroke cycle engine. It was a reinvention of an engine which had been patented in 1862 by Beau de Rochac, but had not been successfully introduced. In the Otto engine the mixture of air and gas is drawn into the cylinder during the second stroke; it is here exploded and during the third stroke expands; on the fourth and return stroke the cylinder is cleared for a new charge. This was the first gas-engine used extensively, and all the practical gas-engines of to-day show no marked departure from the Otto four-stroke cycle. The ignition of the mixture at the proper instant may be done by an electric spark, but is often done by a small gas-jet and a heated ignition-tube. The speed is generally regulated by a centrifugal governor (see GOVERNOR, ENGINE) which controls the supply of gas. Within a few years the use of gas-engines has increased very rapidly. Their adaptation for small powers was evident immediately. Even if the fuel-cost be greater than for a steam-engine, this is more than balanced by the convenience and economy in attendance. Then the gas-engine is costing nothing for fuel when it is at rest, so that it is specially adapted for places where power is only needed a fraction of the day.

But the efficiency of gas-engines in transforming the heat-energy of the fuel into work is from 20 to 25 per cent., twice that of small steam-engines, and, with cheaper fuel than ordinary illuminating gas, it is claimed that gas-engines compete with steam-engines for all-day loads. Recently the vapors of gasoline and petroleum have come into successful use as fuel for such engines. The oil-engine differs from the gas-engine only in being provided with some sort of vaporizer whereby the oil is converted from a liquid to a gas on its way to the cylinder. One of the remarkable exhibits at the Paris exhibition of 1900 was that of large gas-engines. The largest gas-engine at the Chicago world's-fair in 1893 was one of 35 H. P. At the Paris exposition of 1900 there was one engine of 1,000 H. P., and gas-engines giving a hundred H. P. or more were shown to be very common in practice to-day.


A GAS-ENGINE

The gas-motor of Mr. R. Diesel has attracted a great deal of attention from engineers. In the Diesel motor the compression of the mixture (vapor or gas) which was the feature of the Otto engine is carried still further, even to the point of raising the temperature of the mixture to ignition. Tests of this engine give the highest efficiency of any form of heat-engine, but the engine has not yet come into general commercial use.

A. P. CARMAN.

Gates, Horatio, an American general, was born in England in 1728, and, entering the British army, was an officer under Braddock, at whose defeat in 1755 he was severely wounded. He settled on an estate in Virginia, and at the outbreak of the Revolution he espoused the cause of his adopted country, and in June, 1776, was given the chief command of the army which had just retreated from Canada. In the following year he succeeded Schuyler in the command of the northern army; and the defeat and surrender of the British army under Burgoyne, at Saratoga, which followed, gave Gates a brilliant reputation, though the glory belonged in some measure, at least, to Schuyler. Soon afterwards the so-called Conway cabal intrigued to give the supreme command, which Washington held, to Gates, and after that Gates held no command, until in 1780 he was made commander of the southern forces. The disastrous battle of Camden on August 16 deprived him of his military laurels. He was superseded, and was not acquitted of blame by court-martial until 1782. Two years later he freed all his slaves, and settled in New York, where he died April 10, 1806.

Gatineau. Important river 400 miles long in the province of Quebec. Empties into the Ottawa River. Of great commercial importance to the immense lumber-interests of the Ottawa Valley. The whole of the Gatineau valley, comprising an area of 10,000 square miles, is traversed by it. The water power of the cascades on this river is calculated to equal 40,000 H. P. and the rapids of St. Joseph and Des Eaux at 7,700 H. P.

Gat′ling, Richard Jordan, American inventor, of Gatling-gun fame, was born in Hertford County, N. C., Sept. 12, 1818. Early in life he assisted his father in constructing a machine for sowing cotton-seed, and himself invented a machine for sowing rice, which he later adopted for sowing wheat. In 1862 he invented the revolving gun known by his name, and in 1886 invented a new gun-metal, consisting of steel and aluminum. He also invented a steam-plow and a hemp-breaking machine. Congress voted him $40,000 for proof-experiments in a new method of casting cannon. He died on Feb. 26, 1903.

Gaul. See FRANCE.

Gauss (*gous*), **Karl Friedrich,** a noted German mathematician, physicist and astronomer was born at Brunswick, April 23, 1777, and died in Göttingen in 1855. In his 30th year he was appointed director of the observatory at Göttingen, where he spent the remainder of his life. At 25 he had published a very important mathematical paper; at 32 he published his great work on mathematical astronomy, entitled *Theory of Motion of Celestial Bodies.*

In conjunction with Wilhelm Weber, professor of physics in the University of Göttingen, he made an elaborate and profound study of the earth's magnetism and instituted our modern system of absolute magnetic measurements. To Gauss is also due our only satisfactory and accurate method of discussing optical instruments.

Gautier (*gō′tyä′*), **Théophile,** a distinguished French novelist and *littérateur,* was born at Tarbes, Aug. 31, 1811, and died at Neuilly, Oct. 22, 1872. He began life as an artist, but abandoned painting for literature. Early in his career, having become acquainted with Victor Hugo, he threw himself into the romantic movement, which at this time manifested itself in French literature. In 1835 appeared his notable novel, *Mademoiselle de Maupin,* which, in spite of its licentiousness, established its author's fame. After this followed a number of essays and sketches in literary criticism, including two admirable monographs on Lamartine and Charles Baudelaire. Later he traveled considerably, producing, as the result of his tours, a series of delightful works on Spain, Algeria, Italy, Belgium, Holland, Russia, Constantinople and Athens. Returning to fiction, he wrote *Captain Fracasse, Spirite* and *The Romance of the Mummy,* all full of captivating writing; together with a number of brilliant short stories, of which the most striking, perhaps, is *A Night with Cleopatra.* He also produced many short plays for the stage, besides a *History of French Dramatic Art* (since 1845) and numberless scattered pieces in prose and verse. He possessed, with eminent descriptive powers, a delightfully facile style and great artistic taste. His last book, written during the German siege of Paris, was his *Siege Pictures.*

Gay, John, an English poet, was born in 1685 and died in 1732. He wrote a large number of poems and ballads, besides several operas; but little of his poetry is now read. His greatest success was *The Beggar's Opera,* which ran 62 nights, made the actors celebrated, and in the popular phrase, "made Rich [the manager] gay, and Gay [the author] rich." His *Fables* and his ballad of *Black-eyed Susan* also deserve mention. See Henry Morley's *English Literature.*

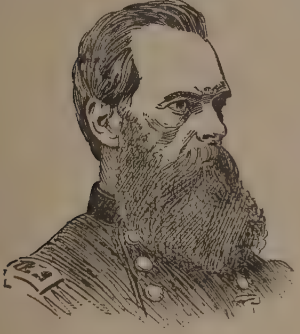
Gay-Lussac (*gä′lü′såk′*), **Joseph Louis,** a French physicist and chemist, was born Dec. 6, 1778, and died at Paris, May 9, 1850. His father's name was Antoine Gay, to which the title Lussac was added, in connection with the ownership of some property. Gay-Lussac was educated at the Polytechnic School in Paris, which he entered at 19. In 1804 he made a great reputation by ascending alone in a balloon to the height of 23,000 feet and there making observations on the earth's magnetism, the moisture of the air etc. For 24 years, beginning in 1808, he was professor of physic in the Sorbonne, which he left to become professor of chemistry at the *Jardin des Plantes*.

One of his most important pieces of work is that in which he proves that, when gases combine with one another by volume, they do so in simple proportions. Thus two volumes of hydrogen combine with one volume of oxygen to form two volumes of water. Equally important, perhaps, is his discovery of the manner in which gases change volume or pressure when the temperature changes. For description of this, see BOYLE'S LAW.

Among his chemical investigations, perhaps his demonstrations of the nature of iodine and of hydrochloric acid are as important as any. In addition to his scientific accomplishments, he was a man of extraordinary breadth, a member of the Chamber of Deputies, widely traveled and largely acquainted with men.

Gazelle. See ANTELOPE.

Geary, John White, American soldier and governor of Pennsylvania, was born near Mount Pleasant, Pa., Dec. 30, 1819, and died at Harrisburg, Pa., Feb. 8, 1873. Early in life he studied law, but never practiced. During the Mexican War he acted as colonel of the 2d Pennsylvania regiment, and was made first commander of the City of Mexico. In 1849 he was appointed postmaster of San Francisco, and in the following year became mayor of the city. In 1856 he was created territorial governor of Kansas. At the opening of the Civil War he raised the 28th Pennsylvania volunteers and rose to the rank of major-general. He took part in many notable engagements and was with Sherman in his march to the sea. In 1866 he became governor of Pennsylvania and held the office until his death.


GENERAL GEARY

Gehenna (*ge-hĕn′ȧ*) or, in Hebrew, **Valley of Hinnom,** was a narrow gorge south and west of Jerusalem. Under the later Jewish kings it became a favorite place for the celebration of idolatrous rites, and when King Josiah restored the old national faith, he "defiled" the valley by covering it with human bones. After this it became the common cesspool of the city, into which its sewage was brought, to be carried off by the waters of the brook Kedron. It is also said that fires were kept constantly burning here to consume the bodies of criminals, the carcasses of animals and whatever else could be burned. Among the later Jews Gehenna and Tophet came to be symbols for hell and torment.

Geijer (*yī′âr*) **Eric Gustaf,** a noted Swedish historian, was born in Wermland, Jan. 12, 1783. Devoting himself to the study of history, he became professor of that branch in the University of Upsala. He also wrote poems and political essays, and was known as a composer and musician. He died on April 23, 1847. His historical works are chiefly confined to the history of his own country.

Geikie (*gē′kĭ*), **Sir Archibald,** F. R. S., director-general of the British geological survey and an eminent authority in geological science, was born at Edinburgh, Scotland, Dec. 28, 1835, and educated at the high school there and Edinburgh University. In 1855 he entered the geological survey and rose to be director-general of the geological survey of Scotland and first Murchison professor of geology and mineralogy at the University of Edinburgh. He has been president of the British Association and of the geological society, and is director-general of the geological survey of the United Kingdom. He has written largely on his special topics, and received many foreign decorations and honors. His chief books are *The Story of a Boulder, Textbook of Geology; Field Geology; Class-book of Geology; The Ancient Volcanoes of Britain;* and he has written biographies of *Edward Forbes, James D. Forbes, Sir Roderick Murchison, Sir Andrew Crombie Ramsay* and other eminent scientists.

SIR ARCHIBALD GEIKIE

Gem′mae (in plants), peculiar reproductive bodies formed mostly by certain liverworts. Each gemma is a disk-shaped mass of cells, and on being separated from the plant it produces a new body. See HEPATICÆ.

Gen′erative Cell (in plants), a general phrase, but technically a cell which is enveloped within pollen-grains, and which gives rise more or less directly to the male cells or sperms. It is a cell which appears in connection with the very small male gametophyte which the pollen (an asexual spore) produces.

Genet (*zhĕ nā*), **Edmond Charles Edouard,** a French diplomatist, was born at Versailles in 1765, and died at Schodack, New York in 1834. At an early age he showed considerable talent as a linguist. After serving for three years in diplomatic service in St. Petersburg, in 1792 he became minister plenipotentiary to the United States. His mission was to have them declare war against England. He was well-received on his arrival and soon began to seek recruits through agents. As Washington, however, had assumed a position of neutrality, Genet was soon notified by Jefferson, then secretary of state, that he must cease to arm and equip privateers in American ports. As he did not obey Jefferson's command, he was recalled by the French government upon the request of Washington. He afterwards became a naturalized American citizen, and married a daughter of Governor George Clinton of New York.

Geneva, Lake of, or **Lac Leman,** lies between Switzerland (to which the greater part of it belongs) and France. It is 1,218 feet above the sea, and stretches 45 miles from east to west in the form of a crescent. Its greatest breadth is 9 miles, its area 223 square miles, and its greatest depth 1,092 feet. The northern shore is a classic spot, celebrated by Rousseau; and by Byron in *Childe Harold* and *The Prisoner of Chillon.* The southern shore has as a background the mountains of Savoy. From the lake Mount Blanc is visible, and, although 60 miles distant, is often reflected in its waters.

Geneva, N. Y., a town in Ontario County, on Seneca Lake, 50 miles southeast of Rochester. It is advantageously situated on high ground, and is the seat of Hobart College, the State Agricultural Experimental Station and of the Delancey Divinity School and school for girls. It is noted for its extensive nurseries. It has a good high-school and well-equipped grammar and kindergarten schools, fine churches and an hygienic institute. It has numerous factories, including stove-foundries, steam-heating boilers, optical works and a fruit-preserving establishment. Population 12,446.

Geneva, capital of the Swiss canton of the same name, is situated at the point where the Rhone leaves Lake Geneva. A Gallic town originally, it fell successively into the hands of Romans, Burgundians and Franks, and, having become the seat of a bishop, a continual feud was carried on from the 12th century between the bishop and the counts and dukes of Savoy. In the meantime the citizens gained considerable liberty, and, in the 16th century, by allying itself with Freiburg and Bern, the republic of Geneva won complete independence. A few years later the republic became Protestant, and Calvin came to Geneva and made it one of the chief strongholds of Protestantism in Europe. During the 18th century it was torn by party strife, and during the French revolution the government was overthrown, and a reign of terror followed. Annexed to France, it again became independent, and in 1815 the city, with its adjoining territory, joined the Swiss confederation as the 22d canton with a representation of seven members in the Swiss National Council. There have since been several conflicts between the popular and aristocratic parties.

Formerly surrounded by walls and in other respects an ancient town, Geneva within the last half-century has become a beautiful and convenient modern city. The Rhone, passing through, forms two islands, on one of which still exists an antique and picturesque cluster of buildings; on the other, laid out as a pleasure-ground, is the statue of Rousseau. Among the fine buildings are a cathedral, which dates back to the 12th century; the university (with 1,158 students and a teaching-staff of 133 members), founded as an academy by Calvin; one of the finest theaters in Europe; and a number of valuable museums. Geneva is famous as a theological, scientific and literary center, and has given birth to many great men, among them being Rousseau, Necker (the famous French minister of finance and father of Madame de Stael), Sismondi, Casaubon, De Candolle and Cherbuliez. Watches, musical boxes and jewelry are the staple manufactures. Geneva is also a canton of Switzerland, with an area of 108 square miles and a population of 150,173. Population of the city 125,520

Genghis Khan (*jen′gĭs kān′*), meaning Very Mighty Ruler, a celebrated Mongol conqueror, was born in 1162, at Deylun Yeldâk, on the River Onon. The son of a Mongol chief, he was called upon to rule his father's people when only 13 years old, and he had to struggle hard for several years against revolts and factions. He was ambitious for conquest, and, starting with a dominion comprising most of the region between the Amur and the Great Wall of China, he conquered empires stretching from the Black Sea to the Pacific, and organized them into states which endured far beyond the short span that usually measures the life of Asiatic kingdoms. He subdued, one after the other, the Keraits; the Naimans, a powerful Turkish confederacy; Tangut, a Chinese empire near the desert of Gobi; and the empire of North China. He then turned westward and conquered as far as India, the Persian Gulf and the Black Sea. Two of his generals even passed through southern Russia, and entered the Crimea, everywhere routing and slaying, and returned by way of Great Bulgaria and the Volga, a wonderful military raid. Genghis died in 1227. See Howorthy's *History of the Mongols* and also Curtin's.

Gennesaret, Lake. See GALILEE.

Gen'oa, a city of Italy, situated on the Mediterranean gulf of the same name, at the foot of the Apennines. It is an important seaport and the capital of a province. The province has an area of 1,582 square miles with a population of 989,538. The slopes of the hills behind the city, down to the shore, are covered with buildings, terraced gardens and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges, rising still farther back, are capped with a line of strong forts, batteries and outworks. The fine half-circle harbor, protected by piers and moles affords an outlet for the products of a wide extent of country — rice, iron, olive oil, silk goods, coral, paper, macaroni and marble. Over 6,000 vessels enter the port yearly, three fourths being Italian. Among the industries are iron-works, macaroni-works and paper-factories. There are many palaces, interesting because of their historical fame and architectural beauty, and some of them contain valuable galleries of paintings. The fine old churches also are splendid with marbles, paintings and rich gildings, among them the Gothic cathedral of St. Lorenzo, built in the 12th century. The university, founded in 1243, with 64 teachers and 1,276 students and auditors, has a library of 120,000 volumes, and there are other academies and schools and one of the finest theaters in Italy.

The history of Genoa presents much the same features as other ancient Italian cities. After falling under the sway of several powers, it became an independent republic, and to protect itself against the Saracens it formed an alliance with Pisa. At the close of the 11th century Genoa commanded large naval forces, and ranked as a powerful naval state, its main power being in its commerce. Internal troubles and wars with Pisa, Venice and the Moors followed, and it again became a subject-state of Milan and then of France. In the 16th century Andrea Doria restored the republic, but it again became a part of France, and in the past century was made a part of the kingdom of Italy. The Genoese are skillful and hardy seamen, and are noted for their spirit of enterprise and freedom. Among the sights of the city is a monument to Columbus, the most famous citizen of Genoa. Population 275,000. See J. T. Bent's *Genoa*.

Genseric (*jĕn'sĕr-ĭk*), the greatest of the kings of the Vandals, was, with his brother Gonderic, ruler of the Vandals after their settlement in Spain. After crushing the Suevi, he led the united Vandals and Alans into Africa in 429 A. D. All Africa west of Carthage fell into his hands. Seizing that city in 439, he made it the capital of his new dominions, and dated his reign, which lasted thirty-seven years, from this conquest. With such cruelty and ferocity did the Vandals lay waste cities, churches and fields, that their name is still used to describe barbarous acts. Genseric quickly built up a great naval power, and his fleets scoured the Mediterranean. In 455 he captured Rome and plundered it for fourteen days. Two expeditions sent to avenge this insult were completely destroyed. Genseric died in 477, to the last holding all his conquests. With great genius as a conqueror and ruler, he made religion the excuse for ruthless cruelty. Once, when leaving the harbor of Carthage on an expedition, his pilot asked him whither he was going. "Against all who have incurred the wrath of God," said the conqueror. He was of low stature, and lame on account of a fall from his horse, always absorbed in his plans, caring little for pleasure, subject to bursts of fury and greedy of conquest.

Gentian (*jĕn'shan*), a widely distributed genus of plants, is of use in medicine for the bitter drug that is made from the roots and used to stimulate the appetite. The common yellow gentian which is so employed abounds at a high altitude in Asia Minor, the Alps and the Pyrenees. The abundant yellow flowers of this gentian, growing upon stems some three feet in height make it one of the beauties of the mountains. Species of gentian are found not only in Europe and Asia, but in North and South America and even New Zealand. The gentian can only with the greatest difficulty be cultivated as a garden-plant.

FRINGED GENTIAN

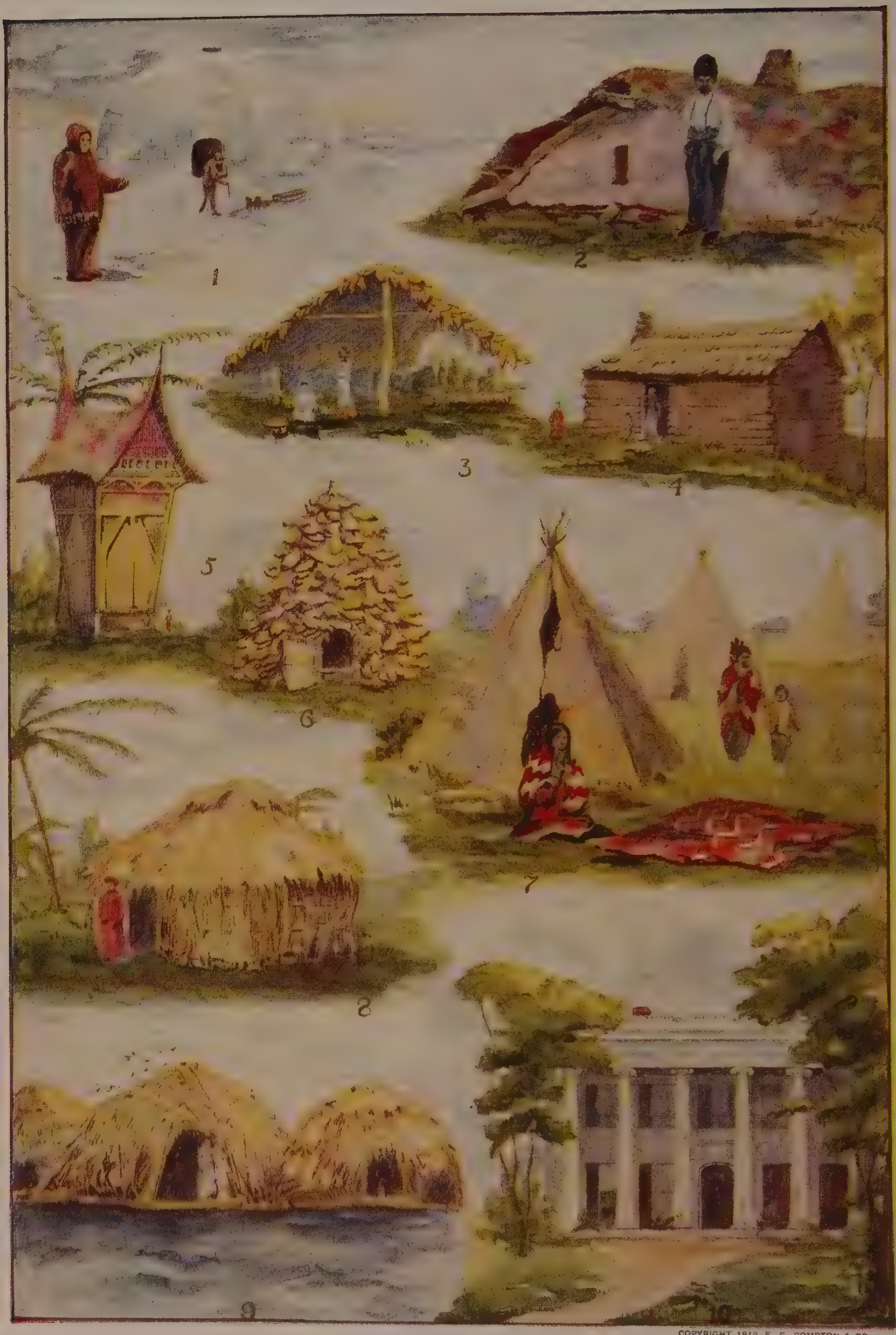
Geof'frey of Anjou. Geoffrey (or Geoffry), Count of Anjou and Maine, provinces in France, married Matilda, daughter of Henry I, King of England. On the death of William, Henry's son, Matilda became heir to the English crown and to the duchy of Normandy; but these were seized by the more popular Stephen. In Matilda's fight for the crown Geoffrey took little part; but he fought unsuccessfully for the possession of Normandy. He died about 1150. His son, Henry, won Normandy in 1151, and made a treaty with the childless Stephen, securing his succession to the English crown as Henry II. Thus Geoffrey, a descendant of the terrible Count Fulc of Anjou, is the ancestor of all succeeding English monarchs. He gained the title Plantagenet from his habit of wearing in his helmet the common broom of Anjou (*planta genista*). His descendants received this title as a surname.

Geog'raphy means strictly a description of the earth. As now used, it is that branch of science which treats of the features of the earth's surface, the division into countries and the plants and animals, including man, which cover it. It may be divided into *physical geography*, dealing with the form and motions of the earth, the atmosphere or air-covering, the land-surface and the water-covering, the facts that make up climate, the great classes of rocks that make up the surface and the leading classes of plants and animals which cover it; and *political geography*, giving an account of the different states or communities into which man is divided. The terms commercial geography, which discusses the products and commerce of the different parts of the world; medical geography, dealing with different places as liable to certain diseases; and oceanography, which investigates the ocean and its inhabitants, are also sometimes used. Thus the study of geography touches in various ways upon many other sciences, as geology, history and astronomy.

The progress of geographical knowledge has depended largely on the progress of discovery. The Phœnicians were the first people who communicated to other nations a knowledge of distant lands. Their voyages before the time of Homer, through the Euxine, the Mediterranean and even into the Atlantic form the first link of the great chain of discovery which, centuries later, was extended by Columbus to the shores of America. Travelers like the Greek historian, Herodotus, whose *History* gives a complete representation of what was known of the earth's surface in his age, did much for the advancement of geography, as did also the exploring and surveying expeditions of Alexander the Great. At the same time Pytheas, the Massilian navigator, was following the path of discovery in the north, possibly as far as Iceland, and in 276 B. C. Eratosthenes first used parallels of longitude and latitude and made maps on mathematical principles. By this time the old idea of the earth as a flat, circular shield surrounded by a rim of water had given place to the belief that the earth is a sphere, revolving with the surrounding atmosphere on one and the same axis. The practical genius of the Romans led them to make a study of the resources of the countries they conquered, which did much for geography. Their greatest work was a survey of the whole empire, including a description and measurement of each province, which was made under Cæsar and Augustus. In the second century of our era Ptolemy wrote a work on geography, in eight books, which for many centuries was regarded as the most perfect system of the science.

The travels of the Venetian, Marco Polo, in the 14th century opened new fields of inquiry, and the close of the next century was marked by the discovery of the American continent. Within thirty years the whole coast of America, from Greenland to Cape Horn, had been explored; the Pacific Ocean had been navigated by Magellan and the world circumnavigated by his ship; the coasts of eastern Africa, Arabia, Persia and India had been visited; and numerous islands in the Indian Ocean discovered. The attempts to find a northwest passage to India increased the knowledge of the Arctic regions. Captain Cook by his long voyages dispelled the old belief in the existence of a great Antarctic continent, and the Antarctic lands have been visited during the 19th and 20th centuries. In the 17th century the Dutch made the Australian islands (which the Portuguese had discovered about 1500 or else in 1601) known to the world, but it was not until within a few years that the first successful voyage was made through the northeast passage around Europe and Asia and through the northwest one around America. In America the travels of Humboldt, Lewis and Clarke, Frémont and others and the work of the United States and Canadian surveys have done much to add to our scientific knowledge. Africa, Asia and Australia are pretty well-known, but are still lands of exploration, though great areas in each have been opened in recent years. Commander Peary, U. S. N., who on April 6, 1909, reached the long sought North Pole; and Nansen; and Sven Hedin in Tibet in 1906–8 are but a few of the many who have enormously extended geographical knowledge recently. The work of making geography is still going on, and is constantly becoming more complete and important. Among the most valuable efforts in this direction may be mentioned the deep-sea exploring expeditions. See PHYSIOGRAPHY.

Geography, Teaching of. Geography is the study of the earth's surface as the



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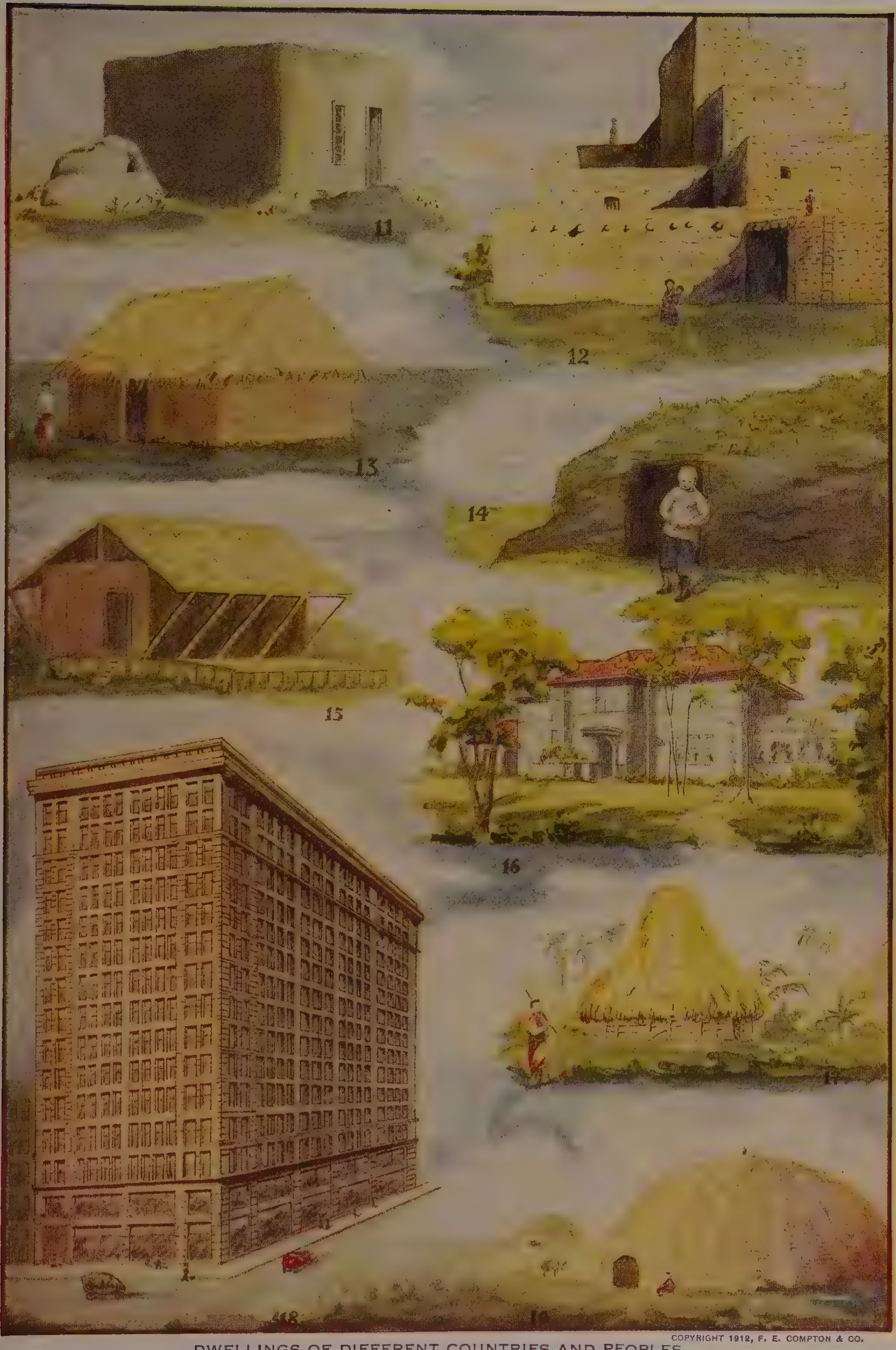
HUMAN HABITATIONS

1—Eskimo Circular Snow Hut. 2—Gipsy Hut, Croatia, Hungary. 3—Hut in Brazil. 4—Pioneer Log Cabin. 5—Home in Sumatra. 6—Congo Hut, made of leaves. 7—Indian Tepees. 8—Porto Rican Hut. 9—Floating Village, Congo, Africa. 10—Southern Mansion, United States.



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DWELLINGS OF DIFFERENT COUNTRIES AND PEOPLES

11—Mexican Adobe Hut. 12—Pueblo Indian Dwelling. 13—Hut in the Friendly Islands, Oceanica. 14—Icelandic Hut. 15—Borneo Dwelling. 16—Modern American Dwelling. 17—Fijian Hut. 18—Modern Business Building, Sky Scraper. 19—Kaffir Hut, South Africa.

home of man. It differs from physiography in this: that while physiography deals with the question how the earth came to be what it is, geography devotes itself to the effects of surface features upon mankind. The chief characteristic of the study is the relativity of man to his home, and not, as often assumed, a mere description of the earth's surface. Neither is the study of man alone any nearer approach to geography but, if anything, a wider departure. Not the home alone, nor man himself, but man in his home,—that is the function of geography proper. To Karl Ritter, the first great teacher of the subject, is due the credit of the present view of the true field of geography. The best-adapted definition of Ritter's somewhat involved one is, possibly, that of E. C. K. Gonner of University College, Liverpool: *Geography may be described as the meaning to man of the earth and its features as they are.*

Such being the scope of the subject, it is possible for its study to begin in the first grade. The outline of a course of study in geography, given by F. W. Parker in his treatise on *How to Study Geography*, is suggestive for all the grades, but that part of it which deals with the work of the first grade deserves distinctive mention. It aims to help the child to find himself, to realize his environment and the relations, so far as he may be capable of observing them, that exist between himself and his home. So taught, it must follow that the child will recognize the meaning which relates the Eskimo to the tundra, the Tibetan to the plateau, the Kirghiz to the steppe, the Negrito to the forest and the Troglodyte to his cave. Studied in the way indicated, strange people will not necessarily seem "freaks," nor other parts of the earth "out of his world." His larger knowledge must increase his humanity, and enhance his appreciation of the earth.

In the first three years of school there is scarcely any need of a separate "study" called geography, such work as that just mentioned being incidental to a study of primitive life, nature-study and other subjects.

But in the fourth or, at latest, in the fifth year of school, geography should find a separate place in the program of studies. The first large subject should be home-geography, in which one takes up systematically the study of the home environment. Most of the principal ideas used in geography can be gotten by careful observation of one's home-surroundings. In this way later geography can be founded on a concrete basis.

The worth of later geography depends very much upon the prominence given to the causal idea. The work is dead, if this idea is omitted and the effort is directed chiefly to location. Here is found the chief difference between the old geography and the new; the former was descriptive and static, the latter is causal and dynamic. If one conceives of the whole earth as a developing body and of the various industries as developing in each country under the influence of *causes*, the study will prove thoroughly interesting and energizing. And that is what modern school geography endeavors to do.

As aids to geography-teaching, a magnet, a compass, a dipping needle, a dial, a weather-vane, a rain-gauge, a thermometer, a barometer, stencils, colored crayon and small papier-maché globes will be found useful from the first, although good work can be done without many of these. For advanced work there are numerous more complex pieces of apparatus that are of value.

If there is one thing needing emphasis in geography teaching, it is more laboratory work, more of the fields, more of the world about us and less of books. Study of the home, therefore, is not to be considered as *finished* after a few months of work upon it in the fourth or fifth year of school.

Geography logically begins with nature study, and develops through an extension of community environment to continental and world environment. It includes such a variety of surface, meteorological, climatic, biological, industrial, commercial, social and political problems, that local material need never be wanting; neither need concrete illustrations in great variety be lacking as the vision of the pupil is extending beyond his own neighborhood.

The making of models representing groups of people in typical settings of the regions which they inhabit will always prove interesting and instructive. A lesson in modeling groups to represent *The Seven Little Sisters* will not fail to satisfy the teacher of the advantage of such work.

The sources of information on this subject other than the regular texts are authenticated cuttings from newspapers, articles in magazines, bits of personal experiences and books of travel, of which there are now hundreds written in a most delightful manner. Such books as Nansen's *Farthest North*, Abruzzi's *The Ascent of Mt. St. Elias*, Hedin's *The Roof of the World* and Borchgrevink's *Story of the Farthest South* are of especial worth, bringing to the class reliable matter rendered doubly interesting by the intensely personal flavor of the recital. It is to be doubted whether there is a better set of books in any single series for geographical work than Reclus' *The Earth and its Inhabitants.* The voluminous publications by our state and national government are also of great value.

For the teacher *The Statesman's Year-Book*, Redway's *The New Basis of Geography*, *The International Geography*, edited by H. R.

Mill, and Adams' *Commercial Geography* are almost indispensable. It should go without saying, of course, that every class-room for the scientific teaching of geography should be supplied with a globe, up-to-date maps, atlases, gazetteers and current geographical magazines.

Ge′olog′ical Survey, United States, is a bureau that was organized by the Department of the Interior in 1879 to bring together the scattered surveys of many western districts and construct geological maps of the United States. The bureau continues to pursue its investigations concerning the products of the country, its mineral resources and the means and possibilities of irrigation. The maps are made in such detail that the scale is never less than four miles to the inch; and is often as large as one mile to the inch. The heights of places are shown by lines, called contours, which represent an equal distance above sea-level. The maps, as they are made, are at once published in folios. The director of the survey issues an annual report. Full information upon the work of the bureau may be gained from the reports of the director, together with Walcott's *The United States Geological Survey*, Washington, 1895.

Geol′ogy. Geology is the science which deals with the history of the earth. It is the task of geology, not simply to recite the history of the earth so far as it is known, but to show how this history became known and how the limits of knowledge are being extended. Geology is a young science, and in its study at the present time it is needful to take cognizance of the limitations of present knowledge as well as of the knowledge itself. Everything which throws light on the history of the earth falls within the field of geology. The history of the atmosphere and the history of the ocean are really parts of geology, since the atmosphere and the ocean are parts of the earth. The popular impression, therefore, that geology has to do only with the rocks of the earth is not altogether adequate. The rocks of the earth, to be sure, furnish the larger part of the data for unraveling the history of the earth, though they are not the only sources of information. It is to be remembered, too, that in the study of the rocks, it is study of them for the sake of the light they throw on earth-history, rather than study of them for their own sake, with which the geologist is primarily concerned.

In working out the history of the earth, so far as it has been worked out, the line of approach has been through the study of the changes which are now taking place on the earth's surface. The rain falls on the land, and some of it gathers into streams, and the streams flow into the sea. In the flow of the water the substance of the land is worn away, the material carried to the sea and deposited there in the form of gravel, sand, mud etc. The sand and mud need nothing but cementation to become sandstone and shale, two of the commonest sorts of rock found on the land. The process of cementation is now going on by natural means in many places. In the sand and the mud, as they are deposited in the sea, shells of various organisms are often imbedded. The shale and sandstone of the land also contain shells and other traces of marine organisms. Hence it is inferred that the sandstone and shale, as well as certain other sorts of rock found on the land, were originally deposited as beds of sand and mud, etc in the sea and that they have since been elevated to the condition of land.

The activities of other surface-agencies are similarly studied. The detailed study of the work now being done by rain and rivers, underground water, waves and currents, the atmosphere, glaciers, changes of temperature, gravity, organic agencies and all other forces and activities operative on the surface of the earth has taught geologists how to interpret the rocks formed in ages long past. It is by the interpretation of the recorded results of the past, in the light of the processes now taking place, that the science of geology has grown up. The study of present processes is becoming more and more exhaustive, and the application of this increased knowledge of present processes to the records of the past is continually enlarging and perfecting our knowledge of the earth's history.

Geology should begin with the origin of the earth, and at this point it trenches upon the field of astronomy. The early ages of the earth's history are as yet speculative. There seems to be good reason for doubting the truth of the nebular hypothesis, which has so long been regarded as satisfactory. The only rival hypothesis which has been framed is the meteoric hypothesis, which affirms that the earth is made up of an aggregation of meteorites comparable to the meteorites and shooting stars, which daily reach the earth by millions at the present time. While the stages of the earth's history preceding the beginning of sedimentation are, at the present time, largely conjectural, many lines of investigation are being pursued which ultimately may throw much light on the early and obscure portions of the earth's history. The general outlines of this history since sedimentation began are probably fairly well-understood, though increased knowledge may modify present conceptions at many points.

The rocks of the earth which contain the principal records of the earth's history are of three great classes: (1) Igneous rocks or those which represent solidified lava; (2) sedimentary rocks, as shale, sandstone, conglomerate, etc., most of which are made up of fragments of older rocks; and (3) metamorphic rocks, which may have been so far altered by various means that they now depart notably from the original forms. In the metamorphism of rocks pressure is the most potent agent. Chemical change, under the influence of moisture, is probably second in importance; and heat third. A special class of sedimentary rocks is due to life. Here belong most limestones, made of shells, corals, etc.; coal, of plant origin; and a number of lesser formations.

The composition, disposition and structure of these several sorts of rock and their fossil contents, so far as they contain fossils, interpreted in the light of processes now taking place, allow geologists to infer the conditions under which the various sorts of rocks are made. When geologists are able to tell what the conditions were on every part of the earth at every period of the past, the science of geology will be complete.

Several subdivisions of geology are often recognized. *Dynamic geology* deals with the agents and forces which have been concerned in making the earth what it is. To dynamic geology belongs the consideration of the activities of rivers, the atmosphere and the ocean, the forces concerned in volcanic action, crustal movements, etc. *Petrography* is that phase of geology which deals with the rocks as such. *Structural geology* is that branch of the subject which deals with the positions of rock-strata and with the relations of rock formations to one another. Structural geology might be defined as the architecture of the crust of the earth. *Physiographic geology* deals with the forms of the surface, and its task is to explain how the present surface came to be as it is. It draws extensively on dynamic geology, since it must consider the forces which have produced mountains, plateaus and plains as well as the details of their surfaces. It draws on structural geology, because the positions in which the rocks occur influence the shape of the surface at the present time. It draws on petrography, because the form of the surface is often affected by the character of the rock beneath. *Paleontologic geology* is that phase of the subject which deals with fossils. The objective point of paleontologic geology is to determine the character of the life of successive ages and the changes which it underwent from time to time. *Historic geology* is that phase of the subject which deals with the application of all other phases of geology to the task of making out the history of the earth, as shown in the rock formations. *Economic geology* is that phase of the subject which deals with the materials of the earth's crust which are commercially valuable. It has to do with ores of all sorts; with coal; with building-stone; with clays which are valuable for the manufacture of brick, pottery, etc.; with materials which can be used for pigments; sand, which can be used for glass; with precious stones; with abrasive materials; with asphaltum, petroleum, natural gas, salt, fertilizers etc. The function of economic geology is to determine the origin of these substances and, so far as possible, the laws which govern their distribution.

Geologic time is divided into five eras and most of these are divided into several periods, as shown in the following table:

ERAS	PERIODS	
Cenozoic	Pleistocene (Glacial)	
	Pliocene	Tertiary
	Miocene	
	Eocene	
Mesozoic	Cretaceous	
	Jurassic	
	Triassic	
Paleozoic	Permian	
	Carboniferous	
	Devonian	
	Silurian (= Upper Silurian)	
	Ordovician (= Lower Silurian)	
	Cambrian	
Proterozoic	Algonkian	
Archean	Archean	

The Archean era was the time occupied in the making of the oldest system of rocks. The Archean rocks are mostly metamorphosed igneous rocks, though with them there are some metamorphic sedimentary rocks. Fossils have not been found in this system of rocks, but it cannot be asserted that life did not exist.

The Proterozoic era is the time during which the great system of rocks lying above the Archean and below the oldest abundant fossiliferous rocks was deposited. The rocks of the Proterozoic era are mainly sedimentary, though igneous rocks have great development locally. The formations of the Proterozoic era are many thousands of feet thick, though considerable portions have been removed by erosion. It has been estimated that the Proterozoic era was perhaps as long as all subsequent time. Life existed during this era, as is shown by the few fossils which have been found and by the nature of some of the formations, even where definite fossils do not occur. For example, there are black shales and graphitic slates, the carbon of which probably is of plant-origin. The Proterozoic (Algonkian) rocks of the Lake Superior region contain rich beds of iron and copper.

The Paleozoic (formerly called Primary) era was the time when the several systems of rocks bearing the names Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian were deposited. The time occupied in the deposition of each of these systems is a period. These systems of rocks are mainly of sedimentary origin, and the materials of which they are composed were derived from the land-areas which existed when these systems were being deposited. These materials were washed down from the land to the sea, and there deposited. The several systems of Paleozoic rocks are distinguished from one another by their fossils. Thus, the fossils of the Cambrian system of rocks are sufficiently unlike those of the Ordovician system to be readily distinguished by paleontologists. Even at the beginning of the Cambrian period the range of life was great, all the great types which are living at the present time, except the vertebrates, being represented. Even the vertebrates may have lived, though relics of their existence have never been found. In this period trilobites and brachiopods were perhaps the most abundant and the most characteristic life, judged by the abundance of fossils. In the rocks of the Ordovician system fish-remains have been found and also relics of air-breathing life. Mollusks, crinoids and corals lived in great profusion, in addition to types of life which predominated in the Cambrian period. Most of the oil and gas of Ohio and Indiana come from the rocks of the Ordovician age. In the Silurian period the same general types of life were prevalent, but the species are so far unlike those of the preceding period as to be readily distinguished by those who are familiar with fossils. The Devonian period is often known as the Age of Fishes, on account of the abundance of fish-remains which have been found in the rocks of this system. It is far from certain, however, that fish were more abundant than now, and the variety of fish was probably less than at the present time. The Devonian was, however, the first period when fishes were abundant, so far as now known. The oil of Pennsylvania and Canada is largely derived from beds of the Devonian age. During the Carboniferous period there were extensive marshes in the United States and in some other parts of the world, in which vegetable-matter accumulated in great quantity. These marshes were subsequently submerged, and the vegetable matter was buried by sediments and ultimately converted into coal. Most of the coal of the United States east of the Great Plains was accumulated at this period. Plant-life was abundant, but the plants were largely of types now extinct. It was during this period, as far as now known, that reptilian life began. The Permian period represents a transition stage between the Paleozoic and the Mesozoic era. In the Permian period there was extensive glaciation in Australia, South Africa and India.

The several systems of Paleozoic rocks have somewhat different distribution, and, since the area of the deposits of any period corresponds approximately with the submerged area of that period, the distribution of the several systems helps us to understand the relations of land and water during the several periods. In this way it is known that the relations of sea and land were different at different times. It would appear either that the continent repeatedly oscillated up and down, causing areas which were at one time submerged to rise to above the level of the water at another and areas which were land at one time to sink beneath the sea at another; or else that the sea-level itself fluctuated. If the sea-level rose, it would overspread the low lands; if it were lowered, it would cause areas which had been submerged to become land. How far the changes in geography were the result of land-oscillations and how far they were the result of oscillations of the sea-level has never been determined. So far as present knowledge goes, it would appear that the deep-sea bottom has at no time been land and that the areas which were alternately above and below sea-level were low when they were land, and covered by shallow water only when they were submerged.

The Mesozoic (formerly called secondary) era, as the term indicates, was the era when life intermediate between the ancient and the present existed. This era is divided into several periods, as indicated above. The Triassic formations of North America are somewhat widespread in the western third of the continent, but have but little development in the eastern part and none at all in the interior. During this period reptiles perhaps were the dominant type of life. They were not only numerous, but the individuals attained great size. The earliest remains of mammals date from this period. Marine life abounded, but departed notably from the types which had prevailed in the Paleozoic era. Vegetation was abundant, but of types now extinct or but meagerly represented. The Jurassic period followed, and the distribution of the Jurassic formations is similar to that of the Triassic. The life of this period was, however, somewhat different from that of the preceding, though the same general types abounded. The oldest remains of birds are found in the rocks of this period. The Jurassic period was followed by the Cretaceous or Chalk period. In the early part of this period chalk was not being deposited, but in the later part chalk-deposits were in process of formation in many parts of the earth. The chalk-deposits are made up, for the most part, of the shells of minute marine animals (see CHALK). The Cretaceous formations of North America are much more widespread than those of the Jurassic and Triassic periods. Their distribution indicates that a large part of the North American continent was submerged during some parts of the period. It was during the Cretaceous period that the modern types of plants and of fishes made their appearance. During the last stages of the Cretaceous period extensive accumulations of vegetable-matter were made in the western third of the United States. These were subsequently converted into coal, mostly soft. The coal of the western part of the United States mostly belongs to the late stages of the Cretaceous period.

The Cenozoic era or era of modern life followed the Mesozoic. Mammals, the earliest remains of which are found in the rocks of the Triassic system, abounded during the Cenozoic era, while the huge reptiles which had been especially characteristic of the Mesozoic era had disappeared. Reptiles still existed as now, but they were of relatively small types, and their numbers appear to have been relatively few. As the Cenozoic era progressed, the forms of life approached more and more closely to those of the present time, and by the end of the Pliocene the life was nearly the same as that which now exists. The Pleistocene period was a remarkable one, on account of the great climatic changes which occurred at this time. The result of these climatic changes brought on a glacial climate, and an ice-sheet or series of ice-sheets covered something like 4,000,000 square miles in the northern part of North America. A large ice-sheet was developed, probably contemporaneously, on the continent of Europe, affecting especially its northwestern part. The history of the Glacial period has been worked out in sufficient detail, so that it is known that there was a series of ice-sheets and not a single one. That is, there were several glacial epochs, with intervening epochs when the ice largely or completely disappeared and the climate became genial. Most of the lakes, waterfalls, etc. of the northeastern part of the United States and of the region to the north owe their existence to the glaciation of the area where they occur. The ice reached its most southerly limit in Illinois, where it descended to about 37° 30′.

The duration of the earth's history is a matter which has received much attention, but no conclusions have been reached which can be relied upon, beyond the very general one that the history of the earth has been exceedingly long. Various conjectures as to the number of years occupied in bringing the earth to its present condition have been made. They range from twenty-five million or so to several hundred million. Geologists in general would not be surprised if it could be demonstrated that the history of the earth since Archean time has occupied 50,000,000 to 100,000,000 years. The Proterozoic era was perhaps as long as all subsequent time. The Paleozoic era was perhaps three to six times as long as the Mesozoic, and the Mesozoic was perhaps three or four times as long as the Cenozoic.

The climatic changes which the earth has undergone have been great, but their causes are not well-understood. There is little basis for the belief, formerly widespread, that the climate has on the whole been growing cooler. Cold periods seem to have alternated with warmer ones. Glaciation was extensive at the close of the Paleozoic and, again, late in the Cenozoic, and there is some indication of cold periods at other times. On the other hand the lands of high latitudes enjoyed genial climates during some parts of the earth's history, even as late as the mid-Tertiary time.

Volcanic activity seems to have been greater at some periods than at others, but on the whole to have been about as great, so far as now known, in the early as in the late stages of the earth's history. See Dana's *Manual of Geology;* Scott's *Introduction to Geology;* Le Conte's *Elements of Geology;* Geikie's *Text-Book of Geology.*

R. D. SALISBURY.

Geom'etry in its origin was the science of measuring the surface of the earth (Greek *gē*, the earth, and *metron*, measure). With the ancient Egyptians, for instance, it took the form of mensuration, because of the need of a yearly survey of the lands that were left bare and muddy after each annual overflow of the Nile. Geometry now is the science of form; although, indeed, the exact geometrical forms are seldom found in nature. Perhaps one should begin to teach geometry as the Egyptians learned it, through making simple geometrical measurements and surveys in the play-ground, of baseball diamonds, hop-scotch courts, a lawn tennis court and so on. For, according to the strictly logical form of Euclid's teaching, it is seldom that a child perceives the need of geometry or begins with an interest in it. For this reason, too, geometrical properties should be taught in the first place largely by paper-folding and cutting, by the use of models, such as the kindergarten gifts, and by the graphical representation of facts that have to do with the other interests and studies of children. The classic work upon Geometry is still the *Elements* of Euclid, who wrote about 285 B. C. in the great days of Alexandria. But geometers of the 19th century declined to be bound by the *Elements*. There arose a *new geometry*, which began perhaps with Carnot. It certainly is necessary for the teacher of geometry to abandon the logical order of Euclid for a more practical and interesting and, in short, more psychological method.

Geoph'ilous Plants are those plants with special subterranean structures which enable them to pass through unfavorable seasons. For example, during a period of drought or cold the aerial parts of such plants disappear, but with the return of favorable conditions the underground parts rapidly send new leaves or shoots to the surface. The underground structures are known variously as bulbs, corms, rootstocks etc. Not only does the geophilous habit serve to bridge over an unfavorable period, but it chiefly enables the plants to develop its working parts with great rapidity during the favorable season. This is a favorite habit with the so-called spring flowers, which usually grow in ravines or forests. These spring-plants must do their work between the first coming of spring-conditions and the coming of the shade produced by the forest foliage. Their working-season, therefore, is very short, and such plants appear above the ground with great rapidity, and their leaves and flowers are to be seen on every hand while the trees are only coming into foliage. The same result is seen when such plants live in dry regions, where the wet season is very short, and where the underground structures enable such plants to do all their work within a few weeks.

George I, son of Ernest Augustus, elector of Hannover, and great-grandson of James I of England, was born at Hannover, May 28, 1660. Immediately after the death of Queen Anne in 1714, he was proclaimed king of Great Britain and Ireland. Several risings on the part of the partisans of the Stuarts were put down in the early part of his reign. The king's personal part in the reign was slight, Sir Robert Walpole being the actual ruler. He was simply a figurehead and did little harm, mainly because of his lack of ability. He died on June 10, 1727. In this reign occurred the rise and fall of the celebrated South Sea Company. See histories of England by Stanhope, Hallam and Lecky.

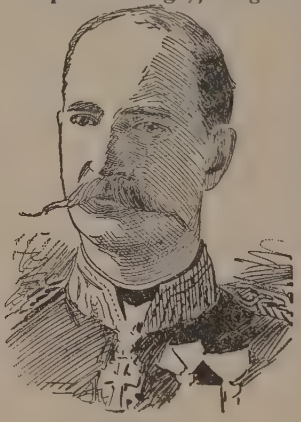
George II was born on Oct. 10, 1683, and succeeded his father as elector of Hannover and king of Great Britain and of Ireland. Though he interfered more than his father had done in the government, yet the policy pursued during his reign was simply that of his ministers, Walpole and Pitt. During Pitt's rule important wars were fought and much glory gained. Among the memorable victories were that of Clive at Plassey and that of Wolfe at Quebec. George II died on Oct. 26, 1760. See histories of England by Stanhope and Lecky; also Thackeray's *History of the Four Georges* and McCarthy's.

George III was born at London, June 4, 1738, and ascended the English throne on the death of his grandfather, George II. Though at the outset very popular, his obstinacy caused him later to lose this popularity, but he regained it in the later years of his reign. He was well-meaning and patriotic, and his long reign of over 60 years was one of the most noteworthy in English history. His obstinacy, however, and the determined spirit of the American colonists lost England the 13 colonies. Notable battles were fought during his reign in America, India and Europe. Great statesmen, such as Chatham, Pitt, Burke and Fox flourished; and great captains, naval and military, such as Nelson and Wellington, made their names immortal. During the last years of his life he was hopelessly insane. He died Jan. 29, 1820.

George V, King of Great Britain and Ireland, was born June 5, 1865, the second son of Albert Edward, Prince of Wales, afterward King Edward VII. He entered the navy as cadet in 1877, passed through the different grades and was promoted to Commander in 1891. He was created Prince of Wales in 1901, after the death of his elder brother. In 1893 he married Princess Victoria Mary, daughter of the Duke of Teck. He succeeded to the throne on the death of his father, Edward VII, May 6, 1910.

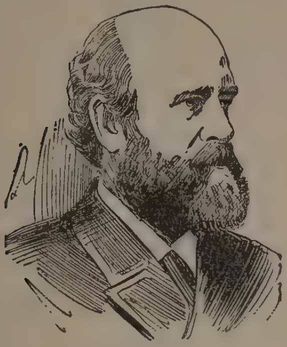
George IV, the oldest son of George III, was born on Aug. 12, 1762. He became prince-regent when his father became insane, and was crowned king of England on his father's death. Little of importance took place during his reign. Besides his many vices and failings, George IV is remembered for his taste for music and literature. He died on June 26, 1830. See Thackeray's *History of the Four Georges*.

George I (Christian William Ferdinand Adolphus George), king of Greece, was the second son of the late King Christian IX of Denmark and brother of the dowager-empress of Russia and of Queen Alexandra of England. He was born at Copenhagen, Dec. 24, 1845, and served for some time in the Danish navy. On the abdication, in 1863, of King Otho I of Greece, the vacant throne was offered by the national assembly at Athens to Prince Christian of Denmark, who, accepting the crown, became king of the Hellenes with the title of George I. In 1867 King George married Princess Olga, daughter of Grandduke Constantine of Russia, brother of the late Emperor Alexander II. In 1898 an attempt, which happily failed, was made to assassinate him. On March 18, 1913, he was assassinated by an anarchist while walking in the streets of Salonica. His eldest son succeeded him as Constantine I.



GEORGE I

George, Henry, American writer on social and economic subjects, was born at Philadelphia, Sept. 2, 1839, and died at New York, Oct. 29, 1897. In early youth he was apprenticed on a sailing vessel, and went to California, and there applied himself to journalism, founding the San Francisco *Post.* In the west he zealously addressed himself to the discussion of public affairs, setting forth his views on land reform in a work entitled *Our Land and Land Policy.* In 1879 appeared his famous work, *Progress and Poverty,* which created widespread and intelligent interest. He returned to the east in 1880 and published a brochure on *The Irish Land-Question,* visited Great Britain, and lectured there and in the United States, discussing the land-question and the economic problems of the time. In 1886 he was a candidate for the mayoralty of New York on the United Labor party's ticket, but was defeated. He founded *The Standard,* which he edited, and also wrote *Social Problems, The Land-Question* and *Protection and Free Trade.* To further his theories, he organized single-tax clubs over the country and addressed them on the special topics in which he was zealously interested.


HENRY GEORGE

George Junior-Republic, The, is a republic of boys and girls founded in 1895 by William R. George of New York City, near Freeville, N. Y. Its purpose is to afford a home, with means of work and education, for homeless or unfortunate children. It is a little community by itself, electing its own officers, legislative assembly etc. after the United States model. At first Mr. George acted as its president, and other adults filled some of the more important offices, but since 1896 all positions have been held by citizens of the republic themselves. The age of entrance is from 12 to 18, and children from any part of the United States may be admitted. The trustees control a farm of 240 acres, and the citizens carry on farming, carpentry, printing, dressmaking, domestic science, etc. Children under 16 must attend the republic's school. Every one of the citizens of this busy little nation is required to do some kind of work. Pay is given in aluminum coin, with which alone can the goods of the community be purchased. At the end of the summer this coin is exchangeable for United States money and the young citizens usually show much judgment and self-control both in saving and spending.

George, Lake, also called Horicon, a beautiful lake, 32 miles long, near the eastern border of New York state. It forms the headwaters of Lake Champlain, is studded with hundreds of picturesque islands, and its shores contain several favorite summer-resorts, especially the village of Caldwell or Lake George. It was the scene of important military operations during the French and Indian Wars of 1755 to 1759.

George, St., the especial patron of chivalry and the protecting saint of England. His history is surrounded by legends. The most probable story is that he was born of noble Christian parents in Cappadocia, became distinguished as a soldier, and, after testifying to his faith before the Emperor Diocletian, was tortured and put to death at Nicomedia, April 23, 303. Reverence for the sufferer spread through Phœnicia, Palestine and the whole east. Churches were built in his honor, and the Hellespont was called St. George's Arm. A legend describes St. George as slaying a dragon. In 1350 Edward III made him the patron of the Order of the Garter, and in the next century Frederick of Austria founded an order of knighthood called after him. He was much worshiped during the crusades, and was adopted as the soldier-saint who led his votaries to victory. He is also the patron saint of Russia. See Baring-Gould's *Curious Myths of the Middle Ages.*

Georgetown, capital of British Guiana, in South America, is situated on the right bank of Demerara River, not far from its mouth. Some of the streets are traversed by canals, with bridges at the cross-streets. The principal public edifices are the government-building, the cathedral, Queen's College and a museum and library. There are a short railway to Mahaica and a telephone and telegraph system. There is a good harbor, with a lighthouse and defenses built within recent years. Population 53,167.

Georgia. Georgia is a southern, Atlantic state and the last settled of the original 13 colonies. It has an area of 59,475 square miles, being as large as England and Wales combined and nearly as large as all the New England States together. It is 320 miles long and 259 wide, and lies between Tennessee and North Carolina on the north; South Carolina and the Atlantic on the east; Florida on the south; and Alabama (with an angle of Florida) on the west.

Surface. The state lies both in the Appalachian and in the coastal-plain region, hence the surface is divided between highlands and lowlands. In the northern section the elevation is between 3,000 and 5,000 feet above the sea-level, the latter height being attained by only a few peaks, the highest of which is Sitting-Bull Mountain, 5,046 feet above the sea. An area of about

6,000 square miles in northern Georgia has an elevation of 1,000 feet or more. The lands bordering directly on the coast are flat and but slightly raised above the sea-level. The Okefenoke swamp in the southern part of the state is 45 miles long and 30 wide. The state is well-drained by rivers of moderate size. Among the larger of these are the Savannah River on the eastern boundary; the Oconee and the Ocmulgee, which form the Altamaha, in the central part of the state; and in the western section the Flint and the Chattahoochee, whose confluence forms the Appalachicola. The coast-line is indented by many deep inlets, some of which form excellent harbors. Separated from the mainland by a navigable channel is a chain of islands, some of them quite large, extending along the entire coast.

Climate. Of nine climatic belts found in the United States, eight are represented in Georgia. The lowest, found on the highest mountain peaks, has a mean annual temperature of less than 40°. Nearly all middle Georgia is in a climate-zone of between 60° and 65°, while that of the southern portion of the state ranges from 65° to 70°. The rainfall is greatest in the extreme north and smallest in the eastern part, averaging about 50 inches for the entire state.

Natural Resources. The forest-timbers of Georgia are many and valuable. An area of 16,000 square miles, chiefly in southern Georgia, is covered with forests of the long-leaf pine, while in the central and northern sections are immense forests of hardwoods, oak, hickory, maple and other varieties. From the pine-forests, besides the valuable timber, are produced large quantities of turpentine and rosin, almost equal in value to the timber-products. The state is divided into three main geological areas: the Paleozoic region in the northwest; the region of Crystalline rocks comprising the remainder of northern Georgia and continuing through the center of the state; and the coastal-plain region. In the Paleozoic area are found valuable deposits of coal, iron, manganese, roofing-slate and aluminum, while the rocks are mostly sandstones, limestones and shales. In the Crystalline area are found granites, gneisses and schists, while on the border of these two regions are found the marbles for which Georgia is famous in every section of the Union. Many magnificent buildings in every section of the United States are constructed of Georgia marble. Extensive and valuable clay-deposits exist in many parts of the state. These are used in the manufacture of bricks, terra-cotta, tiles, etc., while the finer clays are used for crockery and fine china. Gold, it is claimed, was first discovered in Georgia in Lumpkin County in 1828. The town of Dahlonega, in this county, is still the gold-mining center of the state. The other gold-producing counties are White, Dawson, Cherokee, Carroll, Hall, Gwinnett, Columbia and McDuffie. Other mineral products of the state are coal, iron, silver, copper, pyrite, asbestos, talc, mica, barite and marl. Extensive deposits of yellow ochre, used in the manufacture of paints, are found near Cartersville, in Bartow County. There are a number of fine mineral springs in the state, among them Indian Spring, a sulphur spring in Butts County, and Bowden Lithia Springs in Douglas County. Throughout southern Georgia there are many artesian wells.

Agriculture. Agriculture is the leading industry. Owing to the variety of the climate and soil and the varying altitudes of the different sections, the state produces the greatest variety of crops of any state in the Union. In order of precedence the products of Georgia are cotton, corn, hay and grain, truck, horticulture, dairying and live-stock. In the swampy regions of southern Georgia and in the heavily timbered northern section there is much uncultivated land. Between the two sections lies the cotton-belt.

Georgia is the largest producer of sea-island cotton, although this variety covers less than five per cent. of its cotton-growing area. This cotton varies in price from 25 cents to 35 cents per pound. Georgia ranks second only to Texas in the production of cotton, the annual value of the crop being more than $100,000,000. Georgia's corn-crop in 1909 was valued at $52,598,000. Rice is an important crop in the coast-counties, about 8,000,000 bushels being produced annually. Sugar-cane is grown over the middle and southern section, the larger part of the crop being used in the manufacture of syrup. The state ranks first in the production of peaches and watermelons and second in peanuts and sweet-potatoes. Georgia has in its commercial orchards over 16,000,000 peach-trees, whose annual production is valued at over $5,000,000. The famous Elberta peach was originated by Mr. S. H. Rumph at Marshallville, Ga. Pecans are grown successfully in many sections. Tobacco is largely grown in the southern section of the state. Here is the largest tobacco-farm in the world, embracing 25,000 acres and employing 3,500 persons.

Manufactures. Georgia, because of her industrial importance, has long been known as the Empire State of the South. A number of conditions favor the growth of manufacturing interests, one of which is the great output of raw material and another the wide distribution of water-power. In the manufacture of bleached cotton-goods Georgia stands fourth in the Union. In 1909 there were 116 cotton-mills, and the value of the products amounted to more than $48,000,000. Thus the cotton industry, including cotton-seed products—oil and fertilizers—amounts to $100,000,000 annually. Other important manufactures are lumber-factories, printing-establishments, flour and grist-mills, woolen-mills, furniture-factories, foundries, carriage-factories, car-shops, manufactories of brick, tile and pottery. The state exceeds all others in the manufacture of cotton-gins.

Transportation and Commerce. Georgia has superior transportation-facilities The chief trade-centers are Atlanta, Savannah, Augusta, Macon, Columbus and Brunswick. Atlanta is at the junction of the streams of commerce from the northeast, the north and west. Augusta, Macon and Columbus are all situated at the head of steam-boat navigation in the rivers on which they are located. Savannah and Brunswick are the chief seaports of the state. Railway construction dates from 1833 when the Central of Georgia was built from Savannah to Macon. There now are 6,467 miles of railroad connecting the important cities and towns, and the rates of transportation are regulated by law.

Education. The public-school system was established in 1870, and it provides for instruction in the elementary branches at public expense for children between six and 18 years of age. The white and colored children are taught in separate schools. There is a board of education consisting of five members — the governor, the secretary of state, the attorney-general, the comptroller-general and the state school-commissioner. The last is the executive officer of the board. There is in each county a board of education, consisting of five members, elected by the grand jury, and a county school-commissioner, who supervises the county-schools and is elected by the county-board. In the cities and larger towns and in some counties the schools are operated under local laws, which provide for local taxation for schools. The state's public-school fund is about $2,500,000 yearly, and in addition to this over $1,800,000 is raised by local taxation and other means. There are about 740,000 children in the state, two thirds of whom are enrolled in the public schools and are instructed by about 12,600 teachers. In recent years there have been quite an awakened interest in education and much improvement in school-houses and school-work. The towns and cities and many rural communities maintain high-schools, and there are many excellent private preparatory schools.

The state university, established in 1785, is located at Athens. On the campus are located the following schools: Franklin College, State College of Agriculture and Mechanic Arts, State Law School and the College of Pharmacy. The following institutions also are branches of the university: The State Normal at Athens; the Georgia Normal and Industrial College at Milledgeville; the School of Technology at Atlanta; the North-Georgia Agricultural College at Dahlonega; the Georgia Medical College at Augusta; and the Georgia Normal and Industrial College for Colored Youths at Savannah; also, 11 district Agricultural High-Schools.

Emory College, located at Oxford was chartered in 1836, and is the property of the Methodist church. Mercer University, a Baptist college, is located at Macon, and was chartered in 1836. Wesleyan Female College, situated at Macon and belonging to the Methodist church, has the distinction of being the first female college in the world to confer degrees upon its graduates. Other important colleges are Shorter College at Rome; La Grange Female College at La Grange; Bessie Tift College at Forsyth; Southern Female College at College Park; Brenau College at Gainesville; Agnes Scott at Decatur; Lucy Cobb Institute at Athens. For colored students there are Atlanta University, Clark University, Atlanta Baptist College, Morris Brown College and Spellman Seminary, all in Atlanta.

History. Georgia, named in honor of George II of England, was founded by James Oglethorpe, an Englishman, who landed at Savannah in 1733 At that time the territory was occupied by the Cherokee Indians in the north and by the Creeks or Muscogees in the central and southern portions. With these tribes Oglethorpe established friendly relations. For 21 years Georgia existed under a colonial government. Georgia originally extended to the Mississippi, and until 1802 included the territory now embraced by Alabama and Mississippi. Under the laws of the colony the introduction of rum and slaves was forbidden, and slavery was not introduced until 1749. In 1754 Georgia became a royal province, continuing such until the Revolution. In that struggle for freedom Georgia took an active part. Her representatives signed the Declaration of Independence, and on her soil some of the most important battles were fought. After the Revolution Georgia's increase in wealth and population was rapid. In 1861 Georgia seceded from the Union. During the Civil War she furnished not less than 80,000 soldiers to the Confederate armies, and a large part of the gunpowder used by the southern troops was made in Augusta. During the war Georgia bore more than her share of misfortune. Great commercial depression was followed by actual deprivation. At the end of the war it was estimated that four fifths of the public wealth had been destroyed. In 1865 Georgia was placed under military rule, and its affairs were administered by a provisional government until 1870. Georgia has produced many distinguished men. Dr. Crawford W. Long was the first physician to use anesthesia, and Sydney Lanier ranks as one of the foremost American poets. Population 2,609,121.

Georgia, University of, which received its charter in 1785, in certain respects is an instance of French influence upon American universities. The French idea of a university from the time of Diderot to the present has been that of a comprehensive national institution including primary schools, secondary schools and the university proper. The best example of an attempt at a university of this type in America, next to Jefferson's original scheme for a University of Virginia, is the University of the State of New York. Georgia University, in the French spirit, includes not only the university proper, known as Franklin College, but the following attached institutions: The State College of Agriculture, The Law School, The Graduate School, The Medical College, The North-Georgia Agricultural College, The State Normal School, The Normal and Industrial School for Girls, The School of Technology and the Industrial College for Colored People. These institutions, though centralized in the organization known as the University of Georgia, are situated in several different towns. The state makes an annual appropriation for the support of the university, whose students number nearly 3,000.

Georgian Bay. A large bay south of Algoma district, Ontario, and west of Parry Sound and Muskoka district. Bruce Peninsula forms part of its western shore. The C. P. R. steamers westward bound (for Port Arthur) leave Collingwood, which is at the southern angle of the bay. Manitoulin Island forms part of its western boundary.

Geotropism (*jē-ŏt′rō-pĭz′m*) is the sensitiveness of plants to the action of the earth's gravitation, to which they respond by changing the rate of growth or the turgor (which see) of certain regions. This produces a curvature which alters the position of attached parts with reference to the direction of gravitation. Most plant-parts assume a position, fixed by the time they are mature, which is a resultant of the effect of various external factors, especially of light and gravity. But parts still capable of growth and motor-organs (which see), when put in a new position (as when an erect stem is put horizontal), curve so as to bring the parts into the normal position. The parts may be directed toward the earth (primary roots); or away from it (erect stems); or transverse to gravitation at any angle (creeping and underground stems and lateral roots).

Gera′nium, the name in botany of one kind of plants and in popular language of another. The plants known in botany as geraniums are also called cranebills, and a number of varieties are found in the United States. The largest and best known is the spotted cranebill. Its stem is about two feet high, and each of its numerous branches bears two light purple flowers about an inch across. The root-stock is very bitter, is used as medicine, and is also called alum-root. The herb Robert is also a beautiful plant common in our woods, noted for its small flowers, prettily striped and rosy. The plants commonly called geraniums are also known in botany by the name pelargoniums. They are very popular for window-culture, summer bedding-plants and the greenhouse. Many kinds have come from the Cape of Good Hope and some from Australia. The best known is the rose-geranium, which was brought to England in 1690. Other varieties are the peppermint-geranium and fish-geraniums, whose flowers range from white to the most dazzling scarlet and dark crimson.

Gerard (*zhā′rär′*), **Baron François Pascal,** a noted painter, was born of French parents at Rome, March 11, 1770, and when young was brought to France and became a pupil of the celebrated painter, David. His work soon brought him into notice, and he became known as the painter of kings. Among the famous people whose portraits he painted are Napoleon, the Queen of Naples and Talleyrand. He was made first court-painter and raised to the rank of baron by Louis XVIII. The grandest of his works are historical pictures, as the *Battle of Austerlitz*. He died at Paris, Jan. 11, 1837.

Gerhardt (*gĕr′härt*), **Paul,** one of the best writers of hymns in the German Lutheran church, was born in Saxony, March 12, 1607. He wrote 123 hymns, all excellent. Many of them are well-known by translations. *Now all the Woods are Sleeping* is one of his most tender lyrics. He died on June 6, 1676.

German East Africa, the largest colonial possession of the German Empire, extends from latitude 1° S. to latitude 10° 40′ S. and from longitude 29° E. to 40° 40′ E. It is bounded on the north by Uganda, on the northeast by British East Africa, on the east by the Indian Ocean, on the south by Portuguese East Africa, on the southwest by Nyasaland (formerly the Central Africa Protectorate) and on the west by Lakes Nyasa and Tanganyika and Congo Free State. Its extreme length is 725, its greatest breadth nearly 625 miles, and its area of 384,000 square miles equals Arizona, California and Nevada together. Its seacoast extends 620 miles, and inland it borders Lakes Nyasa, Tanganyika and Victoria, the most valuable lakes on the continent. The climate is tropical, but the uplands are inhabitable for Europeans. The native population is 6,750,000, mainly tribes of mixed Bantu race, with over

10,000 Arabs, Goanese, Hindus and Syrians near the coast, and 2,500 Europeans, three fifths of them Germans. The country produces almost every tropical fruit, cacao, coffee, cinchona, fibers, sugar, tea, rubber, tobacco, vanilla, maize. Coal, copper, gold, iron, lead, mica, precious stones and salt have been found, garnets in large quantity; and forests of mangrove, palm and tamarind abound on the coast, while acacias, cotton-trees and sycamores cover the higher areas. The government forests extend over more than 200,000 acres, and the government also operates experiment-stations for stock breeding and tropical culture. The natives in the more settled regions pursue agriculture, some of them cultivating large banana-plantations, and near the coast there are many German estates. Wide, well-kept roads, on some of which rest-houses and supplies are provided, traverse the entire country. From Tanga on the coast a railroad runs to Karagwe (54 miles), from Dar-es-Salaam another to Kingani (50 miles), while the first has a branch (28 miles) to Mombo and the second is to be prolonged to Mrogoro (130 miles). There is extensive transportation along the coast and on the great lakes by means of government-steamers. Few of the seaports are available for ocean ships. Telegraphs connect the towns on the coast with one another, with Ujiji (where connection is made with the line from Cape Town to Cairo) and with Zanzibar. Dar-es-Salaam, the capital, has 25,000 people, but Tabora, two thirds of the way from the ocean to the lakes, is the largest city (pop. 40,000), while Ujiji on the Tanganyika comes third (15,000). The country is administered by an imperial governor, and has 17 government-schools with 3,265 pupils and several hundred mission-schools with 17,000 scholars. The chief imports are cottons, rice, provisions, hardware and iron; the principal exports, rubber, copra, ivory, vegetable fibers and insect-wax.

German Empire, a federation of 25 states, with one imperial province (the reichsland of Alsace-Lorraine), occupying the central portions of Europe. It has an area of 208,780 square miles or about one sixteenth of that of all Europe, — about four fifths of that of Texas. The total frontier line measures 4,570 miles.

Surface. The central and southern parts of the country are occupied by a range of high tableland, broken by mountain ranges and groups, such as the Harz in the north, the Taunus in the middle and the Black Forest and Bavarian Alps further south. The Zugspitz in Bavaria, the highest peak in Germany, is 9,665 feet in height; the Vosges reach 4,700 feet; the Felberg in the Black Forest 4,903; and the famous Brocken 3,740. From the center of the empire north to the German Ocean stretches a vast, sandy plain, broken only by two terrace-like elevations, with an average height of about 600 feet, one near the coast of the Baltic and the other running from Silesia into Hannover.

Drainage and Canals. The country is divided into three drainage-basins. The Danube, with its tributaries, drains the greater part of Bavaria into the Black Sea. But far the greater part of the country has a northern slope. The main streams emptying into the North Sea are the Rhine, the Weser and the Elbe, with their branches. Into the Baltic flow the Oder, the Vistula, the Memel and the Pregel. Numerous canals also connect the great river-systems. The chief are Ludwig's Canal (110 miles long) in Bavaria, which, by uniting the Danube and the Main, connects the Black Sea and the German Ocean; the Finow Canal (40 miles) in Brandenburg; the Kiel and Eider Canal (21 miles), uniting the Baltic with the German Ocean. The North Sea and Baltic Canal (the Kaiser Wilhelm Canal) is 61 miles in length from the mouth of the Elbe to Kiel, and is designed mainly for war-ships. It was opened for traffic in June, 1895. The cost of construction was close upon $40,000,000. The mileage of the canals and inland waterways of Germany is 8,436 miles. There are many small lakes; and swamp-lands and marshes are abundant.

Natural Resources. The mineral products are rich and varied, and furnish one of the chief industries. The chief mining and smelting districts are in Silesia, on the lower Rhine, in the upper Harz and in Saxony. Alsace and Lorraine contain a great part of, perhaps, the largest iron-deposit in Europe. Silesia has the largest coal-field in Europe, and Prussia yields nearly half of all the zinc annually produced in the world. The country is rich in clays of all kinds, and the porcelain of Meissen, the pottery of Thuringia and the glass of Silesia and Bavaria are celebrated. The mineral springs have been famous from the earliest ages.

Forests and Game. Fir, beech, pine and oak are the chief forest-products. Small game of all kinds abounds in the forests, and a few wild boars and wolves are still found. The chamois, red deer, wild goat, fox and marten find shelter in the Bavarian Alps. In all the plains of the north storks, wild geese and ducks are abundant. Carp, salmon, trout and eels are widely distributed, and the oyster, herring and cod-fisheries form important branches of commerce.

Agriculture. About 49 per cent. of the entire area of the empire is given up to plowed land, garden-land and vineyards, and about 26 per cent. is in woods and forests. All the ordinary grains are grown in the north; the vine is brought to great perfection further south; the hops of

Bavaria have a high reputation; the chicory grown there and in the district between the Rhine and the Elbe is used all over Europe as a substitute for coffee; potatoes are an important crop; and Madgeburg is the center of a large beetroot-growing industry.

Manufactures. The oldest and most important of the German industrial arts are the manufactures of linen and woolen goods. The silk-industry is also notable. The making of toys and wooden clocks and wood-carving, which are almost a specialty of Germany, flourish in the hilly districts of Saxony, Bavaria and the Black Forest. The iron and steel-works of Silesia, Hannover and Saxony; the glass-works of Silesia; the china and earthenware of Saxony and Prussia; the silver, gold and jewelry-work of Augsburg, Nuremberg, Munich and Berlin; and the typefounding, printing and lithography of Leipsic and Munich are among the most important manufactures. Over a thousand million gallons of beer are brewed yearly.

Education. Education is more widely spread in Germany than in any other country of Europe. There are 21 universities, numerous scientific schools, 1,340 gymnasia or academies and other schools, besides 60,000 common schools. Public libraries, museums, botanical collections, picture-galleries, schools of music and design and academics of art and sciences are to be met with in most of the capitals and in many of the other cities. The press annually sends forth from 8,000 to 10,000 works, while about 3,000 newspapers and journals circulate throughout the empire.

Commerce and Communication. The German mercantile fleet is the fourth in the world, being excelled only by those of Great Britain, the United States and France. It consists of 2,702 sailing vessels and 1,973 steamers, with a total of 73,993 sailors. Its total tonnage is 2,903,570 tons. Hamburg, Bremerhaven, Stettin, Dantzic, Kiel, Lübeck and Königsberg are the chief ports. About 24,817 vessels ply on the numerous navigable rivers and canals. The first railroad in Germany was built in 1835, and there is now a total length of railroads of 37,441 miles. The postal and telegraph systems of all the German states, except Bavaria and Wurttemberg, are now under a central administration, and since 1872 a German-Austrian postal union has been in operation. There are over 224,794 kilometers of telegraph lines in the empire.

Army and Navy. The imperial army has a grand total of 589,676 men and 24,687 officers on a peace-footing and on a war-footing about 3,000,000, besides the *landsturm*, a reserve-force called out only in the last necessity. Every German who is capable of bearing arms must serve in the standing army for seven years, three years in active service and the remainder in the army of reserve. He then spends five years in the first class of the *landwehr* or militia, after which he belongs to the second class until his 39th year. Besides this, every German from 17 to 21 and from 39 to 45 is a member of the *landsturm.* The yearly cost of the army is over $200,000,000. The fleet consists of over 200 vessels, (cruisers, battleships and torpedo-vessels) manned by 11,246 seamen and officered by 10 admirals and 688 other officers. The seafaring population (estimated at 80,000, of whom 50,000 are serving in the merchant-navy) is liable to service in the navy instead of in the army.

People and Cities. Four fifths of the population (now 64,903,423) of this country are of the race called in English, Germans, in French, *Allemands;* but by the people themselves, *Deutsche.* Among the peoples who retain their own language are Poles, Wends, Czechs, Lithuanians, Danes, French and Walloons. The Germans are divided into High and Low Germans; the language of the former is the cultivated language of all the states, that of the latter is spoken in the north and northwest. There are believed to be about 25,000,000 Germans beyond the boundary of the empire. During the last 50 years emigration from Germany has been very large; but since 1881, when the number was 220,798, it has decreased. About five sevenths of the emigrants came to the United States. The average density of the population in Germany is 310 to the square mile; while Saxony, the most densely populated state, has 829 people to a square mile. There are about 83 cities with a population of 50,000 and upward; 45 with over 100,000; and 116 with between 20,000 and 100,000. The largest cities are Berlin (2,070,695), Hamburg (932,078), Breslau (511,891), Munich (595,053), Dresden (546,882), Leipsic (587,635) Cologne (516,167), Frankfort (414,598), Nuremberg (332,651) and Hannover (302,384).

Colonies. Germany has colonies and dependencies with a total area of 1,027,120 square miles, with an estimated population of close upon 15,000,000. In Africa she has Togoland, Kamerun, German East Africa and German Southwest Africa; in Asia she has Kia-chau Bay; and in the Pacific, besides Kaiser Wilhelm's Land, Bismarck Archipelago and the Solomon Islands, Germany has the Marshall, Caroline, Pelew and Marianne Islands, with possessions in Samoa. These have been acquired chiefly since 1884. In 1905 the value of the imports from the colonies was over 18,000,000 marks; while the exports to the colonies amounted to 46,346,000 marks.

Government. The position of emperor of Germany is hereditary. There are two legislative bodies: the *bundesrat* or federal council, the members of which are annually appointed by the governments of the various states; and the *reichstag* or national representatives, the members of which are elected by general ballot for a period of five years. Acting under the direction of the chancellor of the empire, the bundesrat, besides enacting laws, acts as a supreme consulting and governing board, and has 11 standing committees — for the army, navy, trade, foreign affairs, railroads, etc. It has 58 members, all of whom have the right to be present at the deliberations of the reichstag. The reichstag contains about one member for every 131,604 inhabitants and has 397 members. It must be called together every year, but cannot be assembled unless the other house is also in session. Its proceedings are public; the members are paid and enjoy certain privileges; and it elects its own president. All laws must receive the votes of a majority of both houses, and must have the assent of the emperor and be countersigned by the chancellor, who is appointed by the emperor and is president of the bundesrat. The emperor, with the consent of the bundesrat, can declare war, make peace, enter into treaties with foreign nations and appoint and receive ambassadors. But if the territory of the empire is attacked, he can act independently in declaring war. The chief political parties may be roughly grouped as Liberals, Conservatives and Clericals. The first includes the National Liberals, whose object is a united Germany on constitutional lines, and the *Freisinnige*, who are the advanced wing and favor radical changes. The second includes the Conservatives proper and a more advanced wing called the Imperial party. The Roman Catholic Clerical party is the Center or Ultramontane party. Among smaller parties the most important is the Social Democrats. The position of the chancellor now depends on the support of a particular party, as does that of the prime minister in England. For years Prince Bismarck formed alliances, now with this party and now with that, according to the aim he had in view; and his opponents, even when they defeated his measures, had no thought of superseding him. The states are joined together in an "eternal union," and have no power to withdraw. Whenever the laws of the empire and of individual states conflict, those of the empire prevail.

History. The Germans first appeared in history when they came in contact with the arms of Rome in 113 B. C. They were not a single nation, but a multitude of separate and independent tribes, connected only by the fact that they were of the same race and language and alike in their mode of life. Many of the tribes became subject to Rome. But in the first few years of our era Arminius led a national revolt, overthrew the Roman, Varus, and slew him and his legions; and about 200 years later the Romans were called upon to defend their own empire against their former subjects. The single tribes now began to form into groups, as the Goths, Franks, Frisians and Saxons, and the invasion of Europe by the Huns forced these races to cross the boundary and overrun the Roman empire. Of the many confederations existing after the breaking up of the Roman empire, the Frankish was the one which formed the kingdom both of France and Germany. The Franco-Merovingian empire in France spread across the Rhine, and with Charlemagne, who was crowned emperor in 800 by the pope, began the long line of emperors and kings who occupied the German throne for more than a thousand years. With his death ended the strength of the vast empire he had reared on the ruins of the Roman power, and in 887 occurred the final separation of Germany and France. At this period there were in Germany five nations: the Franks, Saxons, Bavarians, Swabians and Lorrainers, of whom the Franks were the most powerful; and, after the death of the last of Charlemagne's descendants, the Frankish chief became emperor of Germany in 911. After his death the house of Saxony reigned over the empire for 100 years and was followed by that of Franconia, whose greatest emperor was Henry III (1039–56), who did much to check the insolence of the great German nobles and strengthen the empire. In 1138, with Conrad III, began the so-called Hohenstaufen dynasty, to which belonged the famous Frederick I (1152–90), surnamed Barbarossa. This great monarch spent most of his life in wars, and took part in the crusades, in which both he and the flower of chivalry perished. An interval of struggles and foreign wars followed his death, until in 1273 the declining glory of the empire was in part revived by Rudolf I, the earliest of the Hapsburg line which still rules in Austria. For the next 200 years the history of the German empire presents few features of interest. During the rule of Sigmund occurred the celebrated council of Constance, in 1414, at which John Huss was condemned to be burned for heresy. Under Maximilian I, Luther began to preach the reformed faith, but it was during the reign of Charles V (1519–56) that this faith was firmly established in Germany. At the same time occurred the Peasants' War, which threatened to undermine the foundations of society. In 1618 began the disastrous Thirty Years' War, the effect of which was to depopulate the rural districts of Germany, destroy its commerce, burden its people with heavy taxes, cripple the already weakened power of the emperors and cut the empire into a multitude of little states, the rulers of which exercised almost absolute power within their own territories. The War of the Spanish Succession (1702–13) brought glory to the German arms through the great victories of Prince Eugene, together with the English general Marlborough, over the French, but brought no solid advantage to the empire. During the Seven Years' War (1756–63), Frederick the Great of Prussia won the name of a skillful general at the expense of the empire.

During the European wars which followed the French Revolution, Germany was almost entirely at the mercy of Napoleon. In 1805 Francis II resigned the German crown, and became emperor of Austria, and the old empire was at an end. After the fall of Napoleon those states which still were independent combined in 1815 to form a German confederation. Of the 300 states into which the empire had once been divided, there remained only 39, a number afterward reduced to 35. The old *diet* or assembly, which had formerly elected the emperors, was reorganized but failed to satisfy the nation, and in 1848 insurrections of the discontented people broke out, but ended in nothing. Austria and Prussia had long been rivals for the leadership of Germany, and had made the *diet* the arena for their rivalry. In 1866 war broke out between them. The Prussian host of 225,400 men entered Bohemia, and, meeting the Austrian army, 262,400 strong, decisively defeated it in the battle of Sadowa and, pushing on toward Vienna, forced a peace which shut out Austria from a share in the future organization of the German states. The states north of the Main were united with Prussia in what was called the North German Confederation. On July 19, 1870, the long-threatened war between Prussia and France broke out. The southern German states at once decided to support Prussia and the northern states, and placed their armies at the disposal of King William. The Germans were victorious in battle after battle, and pushed on steadily, though with heavy loss, toward Paris. The French emperor, Napoleon III, was defeated at Sedan, surrendered his army of 90,000 men, and was sent as a prisoner into Germany. The Germans laid siege to Paris, which surrendered on Jan. 29, 1871. France was condemned to pay $1,000,000,000; and the province of Alsace, with the German part of Lorraine, was ceded to Germany. But the most important result of the war was to complete the union of the northern and southern states of Germany. The old empire was restored, with the king of Prussia as hereditary emperor, and on Jan. 18, 1871, at Versailles, France, King William was proclaimed emperor of Germany.

Under the skillful leadership of Prince Bismarck, then chancellor, the new empire steadily grew in power and influence. Troubles arising with the church of Rome have been settled. The spread of socialism has excited, and still excites, some alarm. When Emperor William died, his son Frederick reigned but a few months (March to June, 1888), and was succeeded by his son William II, who has followed the policy of William I and Prince Bismarck, rather than the more liberal one promised by his father's short reign. The young emperor in 1888 and 1889 visited several of the courts of Europe. In 1890 the rupture for some time threatened between William II and Bismarck took place, and the Iron Chancellor, who had so long been the guiding spirit of the empire was deposed. On March 20 General Georg von Caprivi became chancellor, and in 1894 he was succeeded by Prince Hohenlohe-Schillingsfürst. On the death of the latter, in 1900, he was succeeded in the chancellorship by Count von Bülow. Since 1900 Germany has enjoyed great commercial development and enormous industrial expansion, while representative government and socialist ideas have gained ground greatly, until the Social Democrats have become a leading instead of a minor party. See Bryce's *Holy Roman Empire* and Bayard Taylor's, Baring-Gould's and Gilman's *Germany*.

German Language, The, is closely related to English, Flemish and Frisian, forming with these the western Teutonic group of languages. Literary German is essentially the High German rather than the Low German dialect. Old High German dates from the eighth century to the beginning of the twelfth; Middle High German thence to the beginning of the 16th century; and Modern German from the Renaissance to the present time. It is commonly said that Luther was the founder of modern literary German; but, if one may trust his own statement, he merely adopted the official language of the imperial chancery and the imperial court. In this language the Middle High German vowels, long *i*, long *u* and *û*, had given place to the diphthongs *ei*, *au* and *eu*. Luther says (*Table-Talk*, ch. LXIX): "I have no particular language of my own in German, but use the common German language, so that both High and Low Germans may understand me. I follow the language of the Saxon chancery, which all the princes and kings of Germany take as their model; all the free imperial cities and all the courts of princes write according to the chancery of the Saxons and of our prince. Hence it is the most common German language." Certainly, however, Luther's writings and especially his translation of the Bible did much to fix the form of modern literary German. The old German empire indeed, was so divided in its politics, history and religion that modern German has only enjoyed a fixed literary form since Lessing and other pioneers in the middle of the 18th century.

German Oceania comprises the northern section of eastern New Guinea or Kaiser Wilhelm's Land, with islands off its coast; Bismarck Archipelago; part of the Solomon Islands; the Eastern Carolines, of which 32 out of 88 are German; the Western Carolines; the Pelew Islands, 11 out of 56 being German; and the Marianne Islands, seven out of 58 of which are German; the Marshall Islands; and Savaii and Upolu, the two largest of the Samoan or Navigator Archipelago. All require imperial contributions for their administration.

German Southwest Africa is bounded on the north by Portuguese West Africa; on the east by Rhodesia and the Bechuana countries; on the south by Cape Colony; and on the west by the Atlantic, with the exception of Walfish Bay, about midway the coast, which belongs to Cape Colony. It contains 322,450 square miles, with a population of 100,000, largely Bantus and Damaras. The coast is held by the German Colonial Company for Southwest Africa, with the seat of administration at Windhoek. The territory is divided into Damaraland on the north and Namaland on the south. The barrenness of the east and south is being somewhat successfully relieved by artesian-well irrigation. A new harbor has been built at Swakopmund, a narrow-gauge railway connects this port with the capital, Windhoek, 237 miles inland and another runs from Swakopmund to Tsumeb (359 miles). Swakopmund, Karibib, Okahandja and Windhoek are connected both by telegraph and telephone. There is a cable to Europe. Agriculture is practiced chiefly in the form of market-gardening, but there are extensive pastoral interests. Cotton-cultivation has begun, and grape-growing and tobacco-raising are tried. The imports are chiefly provisions, textiles and iron-manufactures; the exports chiefly animals on the hoof, guano and animal-products. Copper is mined, and diamonds and gold have been found. Trade is almost wholly with Germany. The colony is far from self-supporting, and the natives rebel frequently, putting the government to enormous expense.

Germantown, a famous town of Pennsylvania, included since 1854 in the limits of Philadelphia. It was the scene of the defeat of the American army under Washington by the British on Oct. 4, 1777. Washington had learned that Howe had separated a portion of the main division of his army, then at Germantown, and he determined to take advantage of it to attack his camp. Marching all night, he attacked the enemy at sunrise, but the morning was dark and foggy, and the Americans were thrown into confusion. They were seized with panic, though Washington succeeded in retreating in good order. The Americans lost 1,000 men, and the British 600.

German Universities lead the world. Heidelberg, the earliest, was founded in 1386, and there are 21 universities with 3,203 professors and teachers and 44,964 students. Berlin (6,569 students), Leipsic (4,147) and Munich (5,734) are the largest universities; and Greifswald (890) and Rostock (661) the smallest. Of the universities 14 are Protestant, four are Roman Catholic and three are mixed. The government has control over these institutions, and the ministers of public instruction have the immediate charge; and all except three are dependent upon state-appropriations. The ministers of public instruction appoint for each university a curator, who sees that the regulations and laws are enforced. The professors choose a rector, who is the actual head of the university, sometimes a prorector when the sovereign is the nominal rector; and a judge to assist the rector and the deans of the faculties; and a questor, who collects and pays over the fees due from students. There is, besides, a senate composed of these officers, which is called together to decide on important matters. All the universities have the four faculties or branches of philosophy, jurisprudence, medicine and theology, and some add those of political economy and natural science. Entrance to the universities can be made only through the gymnasium or preparatory school, except in the case of foreigners, who are admitted without examination. Students are not obliged to stay in one university, but can study at several, and can enroll themselves in whatever branch they desire to work at. They board and lodge where they please, and enjoy much social liberty. The instruction is by lectures. If a student is expelled from one university he is expelled from all. The course of study is one of four years, except in the medical faculty, which in some institutions is five years.

Germina'tion, the process by which a spore develops a young plantlet. There are certain conditions of germination which are well understood. For example, the spore must have a certain amount of food-material in solution, of heat and of air (that is oxygen). Spores differ widely from one another in the amount of heat necessary for germination, some spores being able to germinate in temperatures which would be impossible in others. The word germination, however, is constantly applied in a popular way to the results which follow the planting of seeds, although this process is not really germination. When a seed germinates, the process does not consist in the formation of a new plant, but in the escape from the seed of a plant which has already been formed. Real germination is the formation of new plants by spores; while the germination of seeds is merely the escape of the new plant from the seed case. However, the conditions which favor the germination of spores are also the conditions which favor the so-called germination of seeds.

Germ Theory of Disease is the theory that most diseases are due to germs or bacteria growing within the body and that a particular kind of microscopic organism is always associated with a particular disease. This has been demonstrated for a considerable number of diseases, as splenic fever, tuberculosis, cholera, diphtheria and others, but clear proof is wanting in regard to many other diseases. Although the connection between disease and microscopic germs had been surmised by a few individuals in the 18th century, it was demonstrated only in the latter half of the 19th century. The names of Pasteur, Lister and, especially, Koch are associated with the establishment of the theory. Pasteur as early as 1857 demonstrated a connection between microscopic organisms and diseases of silkworms. He was guided and assisted in his conclusions by the previous work of Latour and Bassi. Koch in 1877 showed the connection between minute thread-like organisms and splenic fever. Then followed, in 1882, his discovery of the disease-germ of consumption and, in 1884, of cholera. Lister, the English surgeon, showed the immense importance of getting rid of all germs and keeping them away during surgical operations, and this led to antiseptic surgery. Although very minute, the bacteria can be distinguished under the microscope. There are usually several kinds mixed together — some harmless and some harmful. They are separated in a very ingenious manner, being thoroughly mixed in melted or dissolved gelatine, which is then flooded in a thin layer over a sterilized plate. They grow and feed on the gelatine, the different kinds being isolated and held in place by the thickening of the gelatine. In this way a pure culture is obtained. The necessary chain of evidence laid down by Koch for proving the connection of particular organisms with disease is as follows: First, the micro-organism must be found in the fluids and tissues of the diseased subject. Second, this organism must be isolated and cultivated outside the animal's body. Third, a pure culture thus obtained, when injected into the body of a healthy animal, must produce the disease in question. Finally, the same micro-organism must be found abundantly in the fluids and tissues of the inoculated animal. Not all diseases are due to bacteria. Malaria, for example, is due to a minute animal-organism which enters the red blood-corpuscles and develops within them. The particular germ or organism of many diseases has not been determined. The bacteria of a particular disease get into the human body and multiply. Sometimes they are eaten by the white blood-corpuscles, or their growth is limited by unfavorable conditions. Under other conditions they multiply rapidly and invade the tissues, producing the particular disease with which they are always associated. After once having had a contagious disease, one is usually free from another attack. Various explanations have been suggested. It has been suggested, for example, that during the disease certain chemical substances are manufactured and retained in the body that are harmful to that particular organism. It is said, further, that the white blood-corpuscles, which are known to be eaters of bacteria, are better able to cope with a second attack. It is also suggested that the body becomes acclimatized to the poison produced by the bacteria, just as it can become accustomed to tobacco and other poisons. It is to be understood that these are merely theoretical explanations. See Prudden: *The Story of the Bacteria and Their Relations to Health and Disease.*

Gérôme (*zhā'rōm'*), **Leon,** a French painter, was born at Vesoul, May 11, 1824. After studying at Paris and traveling in the east, he was appointed professor of painting in the school of Fine Arts at Paris. His reputation was raised to the highest pitch by his *Roman Gladiators in the Amphitheatre.* Among the best known of his works are *Phryne before Her Judges*, *Cleopatra and Cæsar* and *Lioness meeting a Jaguar.* Many of his works have become widely known by photographic copies. See Stranahan's *History of French Painting.* He died on Jan. 10, 1904.

Gerry, Elbridge, an American statesman of the period of the Revolution and one of the signers of the Declaration of Independence, was born at Marblehead, Mass., in 1744, and died in 1814. He was one of the prime leaders of the opposition in America to British interference, and was closely allied with Samuel Adams in the politics of Massachusetts. On the eve of the battle of Lexington he escaped half-dressed from the British soldiery. It was Gerry who laid the foundation of an American navy, and at the same time suggested the waging of offensive war against England, by a bill in 1775 to fit out vessels against the British vessels and navy. Gerry acted with dignity and severity in the continental congress. He disliked and refused to sign the draft-constitution of the United States; but was elected a member of the first congress. He was re-elected to Congress in 1791. He was envoy to France in 1797; but the embassy was badly received, and was deceived by Talleyrand. In 1810 Gerry was elected governor of Massachusetts, and in 1812 he became vice-president of the United States. As governor he agreed to a bill which changed the districts of the state in such a way as to give a greater number of majorities to his own party. This was the origin of the term *gerrymandering*, which is still applied to political juggling of any kind.

Gethsemane (*ḡeth-sĕm'a-ne*), the scene of the agony of Christ before his crucifixion. It was a small farm or estate at the foot of Mount Olivet, on the east slope of the Kedron valley, rather more than half a mile from the city of Jerusalem. Joined to it was a small garden or orchard, a favorite resort of Christ and his disciples. The place is not now exactly known, but an inclosure with a few old olive-trees is pointed out to travelers as the site of the garden.

Get'tysburg, Battle of. After defeating the Union army under General Hooker at Chancellorsville, in May, 1863, General Lee, the Confederate commander, determined on an offensive campaign. Marching rapidly down the Shenandoah valley, he crossed the Potomac at Williamsport on the 24th of June. Pressing forward, he invaded Pennsylvania, passing through Chambersburg toward Harrisburg. Meantime General Hooker followed after Lee, crossed the Potomac at Edward's Ferry, and advanced to Frederick, Md. He wished to withdraw the Union force which was at Harper's Ferry; this the government at Washington would not permit, whereupon he resigned his command, and was succeeded by General George G. Meade. The new commander pushed forward to Gettysburg, near the southern boundary of Pennsylvania, on which point Lee was concentrating his army. Here the hostile armies, each numbering about 80,000 men, joined issue in what proved to be one of the most terribly destructive battles of the war. The struggle began on the 1st of July, and raged with fearful carnage for three days. On the afternoon of July 3 the Confederates staked everything in a grand charge on the Union center, but were repulsed with terrible slaughter. The Confederate invasion was at an end. Lee retreated on the 4th, and withdrew his shattered columns across the Potomac. The Confederate loss in the battle was over 30,000; the Union loss was 23,000.

The Union victory at Gettysburg, and the capture of Vicksburg, which occurred at the same time, may be regarded as decisive of the war. The struggle continued for nearly two years, and was marked by terrible battles; but from this time the strength of the Confederacy steadily declined, and the power and authority of the Federal government as steadily advanced.

Geyser, a very remarkable phenomenon which occurs in certain regions of the earth which were formerly volcanic and have retained considerable heat. A typical geyser consists of a crater with a funnel-shaped opening into the earth. From this opening, at fairly regular intervals, a column of hot water and steam is ejected, sometimes to the height of a few feet, say five or six, and sometimes to a height of 150 feet, as in the case of the geyser known as Old Faithful in Yellowstone Park. Until about 1870 Iceland was considered the principal seat of geysers — but we now know that Yellowstone Park contains more geysers than all the rest of the known world.

The geyser was first explained by the chemist Bunsen, of Heidelberg, who went to Iceland in 1847 and made an elaborate study of the Great Geyser. His explanation is as follows: A deep crevasse or well-shaped hole in the volcanic rock is filled with water furnished by springs. This water is heated by the lava which is still hot. The circulation of the water in this long tube not being easy, connective equilibrium is not reached. The water in the lower part of the hole is considerably hotter than that in the upper part; for it is under more pressure than that of the atmosphere. Each horizontal layer of water is hotter than the one just above it.

After the water has reached its boiling-point at the top of the column, anything which disturbs one of these layers, *i. e.*, anything which shifts one of the layers into a position a little higher, will relieve the pressure on this layer. The water of this layer will then be above its boiling-point and will burst into steam. This steam will slightly lift the whole column, thus relieving pressure on all water below the disturbance. Hence the whole thing bursts into steam until it is cooled below the boiling-point. The crater catches considerable of the water which has been thrown up and turns it back into the tube. The remainder is made up by springs which feed the tube. And when the whole has been again heated to boiling-point, the eruption occurs anew.

Some of the geysers in Yellowstone Park throw up mud instead of water. These are known as *mud-geysers*.

About a geyser, deposits of mineral matter, which was in solution in the ejected water, are often made, the basins being composed of it. The deposition of the mineral matter is due partly to the cooling of the water, partly to evaporation but chiefly to the influence of minute plants (*algæ*), which live about the geysers, and which have the power of extracting silica, etc. from solution. The beautiful colors of the deposits about geysers are due to the presence of the plants themselves. The deposits often assume fantastic and beautiful forms. See Le Conte's *Elements of Geology* and Geikie's *Geological Studies*. For a description of these geysers see any good treatise on geology.

R. D. Salisbury.

Ghâts or **Ghauts,** a somewhat V-shaped pair of mountain-ranges in India, running parallel to the east and west coasts of the Indian peninsula respectively and converging near Cape Comorin in the south. The range along the eastern coast is known as the Eastern Ghâts and that along the west coast as the Western Ghâts. The word means a landing-stairs.

The Eastern Ghâts on an average have a height of about 1,500 feet, extending from near Orissa to the vicinity of Coimbatore at a distance of from 50 to 150 miles back from the Bay of Bengal coast.

The Western Ghâts are much more distinct and continuous than the Eastern Ghâts, but at one point there is a distinct gap 20 miles wide across, known as Palghat Gap. The Western Ghâts extend from the Tapti valley to Palghat Gap, this section being about 800 miles long, and from there to Cape Comorin, a further distance of about 200 miles. The average height of the Western Ghâts is about 3,000 feet, though in some places it is much greater. The range is for long distances quite near the shore, and the ascent from the coast-side is often very steep.

Ghent (*gĕnt*), a city of Belgium, capital of the province of East Flanders, is situated at the junction of the Lys and the Scheldt, 34 miles from Brussels. It is divided by canals into 26 islands, connected by 270 bridges, and is surrounded by gardens and meadows, while the former walls have been made into pleasure promenades. Among the chief buildings are the cathedral of St. Bavon, dating back to the 13th century (the belfry tower is 375 feet high), the university and the academy of painting. The cotton, woolen and linen manufactures are the chief industries. By the great canal which flows into the Scheldt, Ghent is united with the sea, and it can receive at its docks vessels drawing 17 feet of water. The harbor can contain 400 vessels. With the university, which is a state institution and has 426 students, are united a school for civil engineers and another for arts and sciences.

Ghent was a prosperous city in the time of the Merovingian Franks; in 1007 it was given by the emperor to Count Baldwin IV; and in the 12th century it became the capital of Flanders. In the various wars of which the Netherlands have been the battleground Ghent has suffered severely and has frequently been taken. Falling into the hands of the French during the Revolution, it became the capital of the department of the Scheldt, until, in 1814, it became part of the kingdom of the Netherlands. In 1830 it fell to Belgium. In 1814 was signed here the treaty of peace between America and England, called the Treaty of Ghent. Population 164,659.

REAR-ADMIRAL GHERARDI

Gherardi (*gȧ-rär'dē̤*), **Bancroft,** an American admiral, was born at Jackson, La., Nov. 10, 1832, and entered the United States navy from Massachusetts as midshipman in 1846. Later he entered and passed through the Naval Academy. He became master and lieutenant in 1855, and served on the *Lancaster.* In 1862 he received promotion and took part in the engagement with Fort Macon. In 1863–64 he successively commanded the gunboat *Chocorua* and the steamer *Port Royal* of the western Gulf-blockading squadron. Aboard the latter vessel he took a prominent part in the battle of Mobile Bay. He became commander in 1866, captain in 1874, commodore in 1884 and rear-admiral in 1887. In 1886 he was appointed commandant of the Brooklyn navy-yard; in 1893 he was in chief command at the Columbian international naval parade in New York harbor; and in 1894 he was placed on the retired list.

Ghetto, the name given to a Jewry or quarter reserved for the Jews in a large city according to the custom of the middle ages, was a term first employed in Rome. There Pope Paul IV forbade Jews to venture from their ghetto without a yellow hat if male, or veil if female, to distinguish them. The term is now used of any Jewish quarter, for instance, the densely packed Jewish district in New York City. The Roman ghetto was destroyed in 1885 to make room for a new Tiber embankment.

Ghibellines. See GUELPHS.

Ghiberti (*gē̤-bē̤r'tē̤*), **Lorenzo,** an Italian goldsmith, bronze-caster and sculptor, was born at Florence about 1378. Along with other artists he was chosen by the Florentine guild of merchants to compete for the execution of a gate of bronze. The subject of the design was *The Sacrifice of Isaac,* to be made as a model for one of the panels. The judges selected Ghiberti's design, both on account of the art and beauty of its conception and the delicacy and skill of its execution. He was also intrusted by his fellow-citizens with another gate, which contains ten reliefs on a large scale. He spent 50 years of the most patient labor on the gates, and the grace and grandeur of these compositions are beyond praise. Michael Angelo said that "they were worthy to be the gates of Paradise." Among his other works may be mentioned bronze statues of *John the Baptist, St. Stephen* and others. He died at Florence, Dec. 1, 1455.

Ghike, Helen. See Koltsof-Masalski, Princess.

Ghirlandajo (*gêr-lȧn-dä'yō*), **Domenico Corradi,** nicknamed Il Ghirlandajo (the garland-maker), an Italian painter, was born in 1449 at Florence. As a youth he was apprenticed to a maker of metal garlands, and it was not until his 31st year that he became known as a painter. He painted mainly frescoes in his native city. He also painted, in the Sistine Chapel at Rome, the fresco *Christ calling Peter and Andrew.* Besides these, he executed some easel-pictures of great merit. His mosaic of the *Annunciation* in the Cathedral of Florence is especially celebrated. Michael Angelo for a time was one of his pupils. He died on Jan. 11, 1494.

Giants' Causeway, a sort of natural pier or mole of basalt, in the form of columns, extending from the coast of Antrim, Ireland, into North Channel. It obtained its name from a legend that it was the commencement of a road to be built by giants across the channel to Scotland. It is part of an overlying mass of basalt, which covers almost the whole county of Antrim and the eastern part of Londonderry and appears in several remarkable beds, of which the Giants' Causeway is one. This remarkable bed is exposed for 300 yards, and forms an unequal pavement, formed of the tops of 40,000 vertical, closely-fitting columns, which in shape are chiefly six-sided, though examples may be found of five, seven, eight or nine sides.

Gib'bon Edward, the greatest of English historians, was born at Putney, near London, April 27, 1737. His own autobiography tells clearly the story of his life. A sickly childhood was followed by 14 months at Oxford, which he himself called the most idle and unprofitable months of his life. His adoption of the Roman Catholic faith barred him out of Oxford, but at Lausanne, on Lake Geneva, he again became a Protestant. Here he spent five years carrying out those private studies in French literature and in the Latin classics which, aided by his prodigious memory, made him a master of learning without a superior. In 1758 he returned to his father's house, and spent some time in the wandering life of a captain of grenadiers, and later visited Italy. "It was at Rome," he says, "as I sat musing in the midst of the capitol, while the barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started into my mind." He served for some time in parliament, and in 1776, after the labors of seven years and infinite care in its composition, he published the first volume of the *Decline and Fall of the Roman Empire.* Its success was immediate, but the attack which it contains upon Christianity provoked sharp criticism against the author. He again settled at Lausanne, where the six volumes of his great work were finished. His last years were not happy, and he died at London, Jan. 16, 1794. The great work of Gibbon will ever remain one of the masterpieces of history. His glowing imagination gives life and vigor to the stately march of the narrative. His one great fault was his failure to do justice to the moral grandeur of the early days of Christianity. See Walter Bagehot's *Literary Studies* and Morrison's monograph on Gibbon in Morley's English Men of Letters series.

Gibbons, James, one of the cardinals of the Roman Catholic church in the United States, was born at Baltimore, July 23, 1834, where he graduated at St. Mary's Seminary in 1857. In 1868 he was appointed bishop of Adramyttium and first vicar-apostolic of North Carolina, where his work was marked with a thoroughness and success which led to his promotion to the see of Richmond in 1872. Here his zeal and ability were further demonstrated, and in 1877 he became coadjutor to Archbishop Bayley. On the death of the latter in the same year Bishop Gibbons became Archbishop of Baltimore. He presided at the plenary council of Baltimore in 1884, and Leo XIII, approving of the acts and decrees of this council, created him cardinal in 1886. In this high office he has shown the qualities of a wise and able prelate, and has gained wide influence, not only as a leading churchman, but as a thoroughly progressive and patriotic citizen. He is the author of *The Faith of Our Fathers; Our Christian Heritage;* and *The Ambassador of Christ.*

CARDINAL GIBBONS

Gibraltar (*j̣ĭ-brạl'tär*), a mass of rock in the southwest of Spain, at the end of a low, sandy peninsula which juts out on the Mediterranean. It is a crown-colony and garrison of Great Britain. It rises to a height of 1,408 feet, is three miles in length and three fourths of a mile in average breadth. Its western side is washed by the Bay of Gibraltar, and on the same side at the foot of the rock is the city of Gibraltar, which has a population of 24,701, including the garrison of between 5,000 and 6,000 men. At the northern base of the rock is the open space called the

North Front, extending as far as the British lines; and between the British and the Spanish lines is the neutral ground, which is uninhabited. Almost the entire rock bristles with artillery, and huge piles of shot and shell are stowed away in convenient places ready for use. The approaches from all sides are guarded by a number of formidable batteries, mounted with guns of the heaviest caliber, and by fortifications so strong in themselves and in their relation with one another, that the rock is considered impregnable, so long as there are sufficient garrison and provisions for maintenance and defense. The eastern side is so steep as to be altogether secure from assault.

Gibraltar has been known in history since the days of the early Phœnician navigators. The Greeks called it Calpe, and it and Abyla (now Ceuta) opposite formed the Pillars of Hercules, long held to be the western boundary of the world. It was fortified in 711 A. D. by the Saracen leader, Tarik. It was held later by the Moors and also by the Spaniards. In 1704 it was captured by a combined Dutch and English force. Since that time it has remained in the hands of the British, in spite of desperate efforts of Spain and France to dislodge them. Modern steam-navigation has enabled vessels to pass through the strait twenty miles from Gibraltar, out of reach of the British guns, so that the impregnable fortress is no longer the key to the Mediterranean. See H. M. Field's *Gibraltar*.

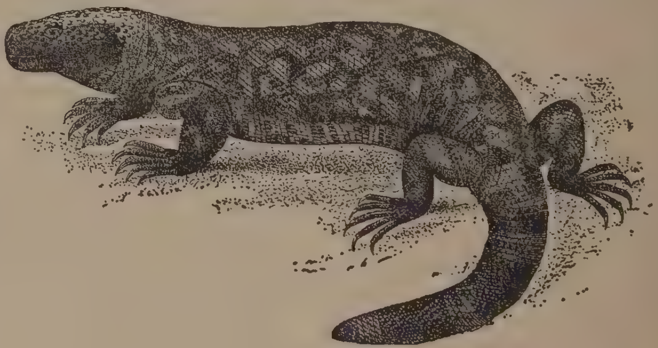
Gibson, Charles Dana, an American illustrator, was born at Roxbury, Mass., 1867. He studied at the Art Students' League, New York, and as early as 1886 had achieved considerable success as artist for periodicals. In 1889 he studied at Julien's studio in Paris. He was again in Paris in 1893–94, and in London in 1895–96. A considerable amount of his work has appeared in the comic weekly, *Life*. He has shown much cleverness as a society-cartoonist, particularly in his satirical depictions of wealthy society-life. The striking feature of his art is its extreme simplicity. He takes his subjects from such places as the clubs, stations, theaters, music halls and boulevards. He is well-known on account of his creation of the type called the Gibson girl.

Gid'dings, Joshua Reed, an American statesman, was born at Athens, Penn., Oct. 6, 1795, and early removed with his parents to Ohio. He was called to the bar, and became a member of the state legislature. He sat in Congress from 1838 to 1859, and was one of the most outspoken of the antislavery leaders, inspiring Lowell to a trumpet-toned sonnet. In 1842 he was censured by a congressional vote for his agitation, but at once resigned, appealed to his constituents and was re-elected by a large majority. In 1861 he was appointed consul-general in Canada, and died at Montreal, May 27, 1864. He published a volume of speeches and other works.

Gid'eon or **Jerubbaal,** whose name means the hewer, was the greatest of the judges of Israel. His history is narrated in *Judges* 6–8. He is mentioned in *Hebrews* as a hero of faith.

Gila (*hē'lä*), a river of New Mexico and Arizona, the principal branch of the Colorado River. It rises in the Sierra Madre Mountains, flows generally westward, and joins the Colorado about 75 miles above the fall of that river into the Gulf of California. Its length is from 500 to 600 miles. Gold and silver are found near this river in Arizona, and the ruins of an ancient civilization abound in its lower valley.

Gila Monster, the name applied to a poisonous lizard (*Heloderma*) found in the region of the Gila. It is the largest lizard of North America, attaining a length of three feet, and the only poisonous one. It inhabits Arizona, New Mexico and the country southward. It is covered with rounded scales standing out like the heads of rivets. The color is black, with irregular orange spots. It ordinarily is slow and uncertain in its movements. It is shunned by animals and man and held in great fear by the Indians, though it does not begin an attack, and its poison is not necessarily fatal to human beings. The poison acts upon the heart, causing it to stop.


GILA MONSTER

Gil'bert Islands, The, lie on the equator in the Pacific Ocean and consist of sixteen atolls with an area of 166 square miles and a population of 35,200 Exports largely consist of copra and sharks' fins.

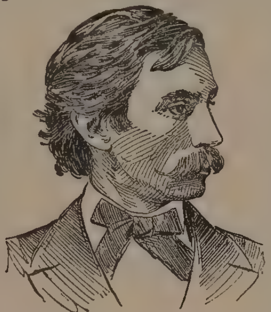
Gilbert, Sir Humphrey, an English navigator, was born near Dartmouth, England, in 1539, and after studying at Eton and Oxford abandoned his purpose of studying law and took to the career of arms. He was knighted for good service in Ireland, and served five years in the Netherlands. He wrote a *Discourse on the Northwest Passage to India.* With his younger half-brother, Sir Walter Raleigh, he sailed in 1578 in quest of the "unknown goal," but his expedition ended in failure. Nothing daunted, he again set sail, and, landing in Newfoundland, took possession of it in the name of Queen Elizabeth. But he lost three of his vessels, and, attempting to return with the other two, his own vessel was lost in 1583. See Hakluyt's *Collections.*

Gilbert, William, an English physician and physicist, was born in 1540, and died in 1603. He was educated at St. John's College, Cambridge, where he received the degrees of B. A. and M. D. For thirty years he was a practicing physician in London. Queen Elizabeth appointed him court-physician and gave him a pension which enabled him to pursue his scientific work. His magnetic discoveries constitute his most important work. These are recorded in his *Treatise on Magnets, Magnetic Bodies and the Magnetism of the Earth,* published at London in 1600. Modern views of magnetism date from the publication of this work; for in it Gilbert offers evidence for thinking that magnetism is a molecular phenomenon, that magnetic quality disappears at red heat, that magnetic forces act equally through air and other non-magnetic bodies and that the earth itself acts as a great magnet. He also describes the phenomenon of magnetic induction.

Gilbert, Sir William Schwenk, English dramatist, was born at London, Nov. 18, 1836, and studied for the bar. He came into note first by his amusing *Bab Ballads,* contributed to *Fun,* and as a playwright and writer of librettos for comic operas, many of which were set to music by the late Sir Arthur Sullivan. The list of the latter includes the following comedies, burlesques and operas: *Pygmalion and Galatea; Trial by Jury; The Sorcerer; H. M. S. Pinafore; Pirates of Penzance; Patience; Iolanthe; Ruddygore; The Gondoliers;* and others. All in their day attained great popularity. Others of his productions include *The Mikado,* which was also a great success, *His Excellency* and *The Mountebanks,* besides a number of songs. He died May 29, 1911.

SIR WILLIAM S. GILBERT

Gilder, Richard Watson, American poet and *littérateur* and editor of *The Century Magazine,* was born at Bordentown, N. J., Feb. 8, 1844, and was educated at Bellevue Seminary, founded by his father, the Rev. W. H. Gilder. In 1870 he became associate-editor of *Scribner's Monthly* with Dr. J. G. Holland, and in 1881 was made editor-in-chief of *The Century.* Besides his magazine-work, he published a number of volumes of musical verse, whose fine quality and flavor have given him high rank among American poets. These include *The New Day,* a volume of choice lyrics, published in 1875; *The Celestial Passion* (1887); *Lyrics* (1885 and 1887); *Two Worlds and Other Poems* (1891); *The Great Remembrance and Other Poems* (1893) all being the work of a genuine poet and literary artist. In 1893 Gilder published his *Five Books of Song,* which embraces most of his poems. His other lyrical and general work includes *Fantasy and Passion, In Palestine, In the Heights, A Book of Music, A Christmas Wreath* and *Poems and Inscriptions.* He died Nov. 18, 1909.



RICHARD WATSON GILDER

Gil′dersleeve, Basil Lanneau, an eminent American classical scholar and professor of Greek in Johns Hopkins University, Baltimore, Md., was born at Charleston, S. C., Oct. 23, 1831, and, after graduating at Princeton, studied in Germany at Bonn, Berlin and Göttingen. In 1856 he was elected professor of Greek in the University of Virginia, where he remained till 1876, when he accepted a similar post at Johns Hopkins on the opening of the latter institution. Professor Gildersleeve has since 1880 edited the *American Journal of Philology,* and has published a *Latin Grammar,* a *Syntax of Classical Greek, Essays and Studies,* editions of the *Satires* of Persius, the *Odes* of Pindar and a work on *Justin Martyr.*

Gil′ead is a mountainous district on the east side of the Jordan. Though all is desolate above, on the slopes the growth is luxuriant, and forests of oak and terebinth occur. The district was given to the tribes of Manasseh, Gad and Reuben, because of the multitude of their cattle, and, as a frontier land, was much exposed to invasion. Ramoth, Jabesh and Jazer are three of its cities mentioned in Scripture. A plan has been presented to the government at Constantinople to have this region colonized by Jews. See Oliphant's *Land of Gilead.*

Gills. See RESPIRATION, ORGANS OF.

Gil'man, Daniel Coit, LL. D., American scholar and educator, was born at Norwich, Conn., July 6, 1831, and was educated at Yale University and at Berlin. In 1855 he became librarian at Yale and professor of physical and political geography, and took an active part in the organization of Sheffield Scientific School. From 1872 to 1875 he was president of the University of California, and in the latter year became president of Johns Hopkins. In 1879 he acted as president of the American Social Science association, and in 1893 became president of the American Oriental Society. His published writings include *James Monroe* (in American Statesmen Series); *University Problems;* an introduction to an edition of De Tocqueville's *Democracy in America;* and *Our National Schools of Science.* He has edited the writings of Francis Lieber, the German-American political economist. His other writings embrace a *Memoir of James Dwight Dana*, the geologist, and a volume entitled *Science and Letters in Yale.* He received the degree of LL.D. from Harvard in 1876, from Columbia in 1887, from Yale in 1889 and from Princeton in 1896. He resigned the presidency of Johns Hopkins in 1901, and was succeeded by Dr. Ira Remsen. He for a time was president, and one of the trustees, of Carnegie Institution at Washington, D. C. He died on Oct. 14, 1908.

DANIEL COIT GILMAN

Gin or **Geneva,** an alcoholic drink, distilled from malt or from unmalted barley or other grain and afterward flavored. The gin, which forms the common drink of the lower classes of London, is flavored very slightly with oil of turpentine and common salt. Usually about five ounces of spirit of turpentine and three and one half pounds of salt are mixed in ten gallons of water; this is then placed with 80 gallons of corn-spirit in a still and allowed to distill. Gin is an article of great manufacture in Holland, whence comes most of that used in the United States. Very little pure gin is found; it consists of 51.6 parts of alcohol in 100 parts.

Gink'go, a genus of one species, commonly known as the maiden-hair tree, because its leaves resemble those of the ordinary maiden-hair fern. This genus is the only living representative of a group of Gymnosperms once widely distributed throughout the world. The ginkgo is commonly used in parks, on account of its unusual and attractive appearance, but it has been chiefly perpetuated by its cultivation in temple-grounds in China and Japan, where it is regarded as a sacred tree. For a long time it was thought that it did not exist as a native tree, but had been preserved from extinction only through cultivation. Recently, however, it has been found in forests in western China, but it does not occur in great quantities, so that it really is almost extinct as a native plant.

Giorgione (*jôr-jō′nā*), meaning Great George, the name given by reason of his stature and his fame to Giorgio Barbarella, an Italian painter, who was born about 1477. At Venice he was a fellow-pupil with Titian, and as a painter he soon gained a reputation. His work showed intense poetic feeling, great beauty and richness of coloring and naturalness and independence in manner. He painted many portraits and did much fresco-work, but only a few canvases known to be his are still in existence. Among them are *The Family of Giorgione*, now at Venice; *The Three Philosophers*, in the Belvedere, Vienna; and *The Sleeping Venus*, in the Dresden gallery. He ranks with the very greatest of Venetian painters, and his example powerfully influenced the artists of his day, even Titian himself. He died of the plague at Venice in 1511.

Giotto (*jŏt′tō*) **di Bondone,** one of the greatest of early Italian painters and also celebrated as an architect, was probably born in 1266 near Florence. At ten he was discovered by the artist, Cimabue, tending his father's flocks and drawing one of the lambs upon a flat stone, and was taken by him to Florence and instructed in art. The earliest of his works that have been preserved are a series of 28 frescoes, scenes from the life of St. Francis, in the church at Assisi. Soon afterward he was employed at Rome, where the mosaic of the *Navicella* may still be seen in the vestibule of St. Peter's, and at Florence, where, in a fresco, occurs a profile-likeness of his friend Dante. The next great series of works by Giotto are the frescoes in the Arena chapel at Padua, where the artist is seen rising to his highest power. The frescoes include 38 subjects from the lives of Christ and Mary, a *Christ in Glory*, a *Last Judgment* and a series of 14 single figures personifying the main virtues and their opposing vices. But the frescoes in the chapels in the church of Santa Croce, Florence, are the finest specimens of the artist's genius. Giotto also did important work at Naples, and in 1334 he was appointed master of works of the cathedral and city of Florence, where he decorated the cathedral with statues and designed the beautiful tower called the Campanile and the vivid bas-reliefs which adorn its base. He died on Jan. 8, 1337. The oft-quoted story of the "O of Giotto" tells how, when the pope sent a messenger to ask the painter for a specimen of his art, with a view to future employment, "Giotto took a sheet of paper and a pencil dipped in red color, then resting his elbow on his side, to form a sort of compass, with one turn of his hand he drew a circle so perfect and exact that it was a marvel to behold," and handed this to the courtier as a sufficient proof of his skill. From this anecdote comes the Italian phrase: "As round as Giotto's O." See H. Quilter's *Giotto.*

Giraffe, a picturesque animal of Africa, with spotted skin and very long neck. The giraffe is the tallest of living animals, a full-grown male being 12 feet at the shoulders and 18 to the crown of the head. It is common in equatorial Africa and Abyssinia, but is not found south of Orange River The skin is dark brown, varying to black in old specimens, with angular, rusty spots. On account of its spotted skin it is sometimes called the camelopard. In spite of the great length of the neck there are only seven (the usual number) neck-vertebræ, each one being elongated. The legs are slender, the fore ones longer than the hind, and end in cloven hoofs. It feeds on the foliage of trees like the mimosas, acacias, etc , gathering its food with the long, slender tongue. It is a ruminant or cud-chewer. The heads of both male and female are provided with horn-like outgrowths of bone, about eight inches long. These are covered with skin, which ends in bristles. The eyes are prominent, and so situated that they can see behind as well as forwards and to the sides; this makes them hard to approach by their two chief enemies, the lion and man. They are hunted on horseback, with selected horses of the best quality, and when overtaken are cut in the ham-strings with a sword, while on the run.

GIRAFFE

Girard (*jĭ-rärd′*), **Stephen,** an American merchant and banker, was born near Bordeaux, France, May 24, 1750. The son of a seaman, he began life as a cabin-boy, became master and part-owner of an American coasting-vessel, and in 1769 was able to start in business at Philadelphia as a small trader. With a remarkable capacity for business and a habit of strictness in money-matters he rapidly grew rich, and was recognized as one of the leading merchants of the city. In 1812 he founded a bank, which proved a great benefit to the national currency. During the War of 1812 he loaned the government $5,000,000. He also became a director in the United States bank. He was frugal and close in business affairs, stern in exacting the last farthing due him, but was generous in public-giving. He was uneducated, and in religion was a freethinker. At his death, which occurred Dec. 26, 1831, he bequeathed most of his vast fortune to public purposes, but the most important gift was that of $2,000,000 and a plot of ground in Philadelphia for the erection and support of a college for orphans, since known as Girard College. The most careful directions were left as to the grounds and buildings. The main building, built of marble, is one of the finest specimens of Greek architecture in America. Boys who are orphans are admitted between 6 and 10, fed, clothed and educated, and, when between 14 and 18, positions are found for them. The principles of morality are taught, but no particular religious creed. There are 1,578 pupils.

Girardin (*zhē-rär-dăn′*), **Émile de,** an eminent French journalist and politician, was born at Paris, June 22, 1806, and educated there. After several early literary attempts he founded in 1836 the *Press* which politically leaned toward the conservative side. Girardin gradually became a Republican. He promoted Louis Napoleon's election to the presidency, but later on threw himself into the arms of the Socialists. He afterward edited the *Liberty,* and his paper was active in urging on the Franco-Prussian War. The *France,* founded in 1874, and the *Little Journal* both supported the republic. He wrote a few pieces for the stage. He died on April 27, 1881.

Girondists (*jĭ-rŏn′dĭsts*), the moderate Republican party during the French Revolution. The name was given because its earliest leaders were from the Gironde department. Early in 1792 Louis XVI was compelled to form a Girondist ministry, but soon dismissed them, a measure which led to the insurrection of June 20, 1792. The Jacobins soon after gained the leadership, and, although the Girondists tried to save the king's life, it was impossible. The fall of their leader, Roland, and the ascendancy of Robespierre followed; and, soon after, many of the members were arrested, tried and sentenced to death by the Mountain, as the extreme party was called. On their way to the place of execution they sang the *Marseillaise.* Sixteen months later the remaining outlawed members returned to the convention.

Girouard, Hon. Desire, born and educated in the Province of Quebec. A graduate in law of McGill University. A successful practitioner and writer on legal and historical topics. More than any other writer he has thrown light on the early history of the Island of Montreal. He was first elected to the House of Commons in 1874 and became an influential member. He was appointed judge of the Supreme Court in 1895, a position which he still holds. Sir Percy Girouard of the Royal Engineers, who has won distinction as a member of Lord Kitchener's staff, is his son.

Glace Bay is a rapidly growing city on Cape Breton Island, fifteen miles by rail from Sydney, with a fine beach. Its 2,459 inhabitants in 1891 were increased to 6,945 in 1901 by the development of the extensive coal mines.

Glaciers. Glaciers are streams or sheets of slowly moving land-ice. They are developed from great accumulations of snow. The processes by which snow is converted into ice are somewhat complex. One factor in the change is the pressure due to the weight of the snow itself. This tends to convert the lower portion of a field of snow into ice. Again, the surface snow of a snow-field is subject to melting during the sunny days of summer, and the water, sinking beneath the surface, may freeze again. In freezing, it not only becomes ice, but tends to bind the snow where it freezes into a solid mass. The ice of glaciers is in more or less distinct layers, some of which are bluer and more compact than others. Since glaciers are formed from large accumulations of snow, it follows that they are found only where conditions are such as to allow the accumulation of snow in large quantities.

GLACIER OF ZERMATT, SWITZERLAND

When the ice in a snow-field becomes sufficiently thick, movement begins. The exact nature of the motion is somewhat uncertain, but the results are such as they would be if the ice flowed like an extremely viscous fluid. The ice is, however, so brittle as to break under tension, and crevasses are formed where the ice moves over considerable irregularities of bed, and in some other circumstances. The rate of motion is very slow, usually varying in glaciers which have been studied from a few inches to a few feet a day. Once in motion, the ice moves forward and downward until it reaches a position where melting balances forward motion.

Glaciers occur in high altitudes in all latitudes and in all altitudes in high latitudes. There are various types of glaciers, chief among which are (1) narrow valley-glaciers like those of Switzerland, called *alpine* glaciers, and (2) broad ice-sheets like that of Greenland. Glaciers of the alpine type abound in many high mountains. The best known are in Switzerland and Scandinavia, but alpine glaciers also occur in the Pyrenees, the Caucasus, the Himalayas and the Tien Shan Mountains, in the Cordilleras of the western part of North America, in the Andes of South America and in the high mountains of some other parts of the world. The Alps alone harbor more than 1,000 glaciers, most of which are very small, the largest (the Aletsch) being scarcely more than ten miles long. Glaciers are numerous in the northwestern part of the United States, especially in the Cascade Range. Though the glaciers of this region have never been enumerated, there certainly are many hundreds, probably thousands of them. Glaciers occur in the Sierras as far south as central California. They abound in the Cordilleras north of the United States, and are found on some of the higher mountains of Mexico. The best-known ice-sheet is that of Greenland, which has an estimated area of between 300,000 and 400,000 square miles. The most extensive ice-sheet is that of Antarctica, the area of which perhaps is ten times as great as that of the ice-sheet of Greenland.

One ice-sheet may give rise to many glaciers about its borders, as in the case of the Greenland ice-sheet; or glaciers from small ice-sheets may unite to form a single glacier as in many mountain regions.

In their movement glaciers produce notable effects on the surfaces over which they pass. In the first place, they gather up the loose débris on the surface over which they move. This débris is carried forward a greater or less distance, and finally deposited. If the surface over which a glacier moves is rough, the ice tends to make it smooth by breaking off the projecting points. The bottom of the ice thus becomes charged with stony débris, and this débris increases the wear which the moving ice inflicts on the surface over which it passes. The earthy and stony material carried by the ice is moraine matter. The larger part of it is carried in the base of the ice. After deposition this basal material is called *ground moraine*. If the end of a glacier or the edge of an ice-sheet remains constant in position for a long period of time, considerable accumulations of *drift*, as the débris is called, are made at the margin of the ice. Such marginal accumulations are *terminal moraines*. The surfaces of alpine glaciers often carry some débris. If this is arranged in belts along the sides of a glacier, these belts are *lateral moraines*. The same name is applied to belts or ridges of drift deposited along the lateral margins of a glacier. If the débris on the ice is arranged in belts remote from the edges but lengthwise of the glacier, they are *medial moraines*. The material of lateral and medial moraines does not chiefly fall on the ice, as is commonly supposed, but works up from beneath. The melting of the ice gives rise to abundant water, which frequently carries away the material which the ice has carried and deposited.

In high latitudes glaciers often descend to the sea before being melted. In this case their ends may be broken off and float away as icebergs. In mountain regions the ends of glaciers sometimes break off and fall or slide rapidly down precipitous mountain slopes. Such ice slides, like slides of snow in great quantity, are avalanches.

At certain periods in the past history of the earth ice-sheets have been very much more extensive than now (see glacial period, under GEOLOGY). See *Glaciers* by Shaler and Davis; also articles on glaciers in the *Journal of Geology*.

R. D. SALISBURY.

Glad'den, Washington, American author and Congregational clergyman, was born at Pottsgrove, Pa., Feb. 11, 1836, and graduated in 1859 from Williams College. He has held pastoral appointments in Brooklyn, N. Y., Morrisania, N. Y., North Adams, Mass., Springfield, Mass., and now is pastor of the First Congregational Church, Columbus, O. He has written largely on religious subjects as well as upon social reform. His chief works embrace *Applied Christianity; The Christian Way; Who Wrote the Bible?; The Church and the Kingdom; Ruling Ideas of the Present Age; Tools and the Man;* and *Social Salvation.*

Glad'iator, a professional fighter in the arena of a Roman amphitheater, against either another gladiator or a wild beast. The custom of giving gladiatorial shows seems to have been borrowed from Etruria, where slaves and prisoners were sacrificed on the tombs of illustrious chieftains. At Rome they took place at first at funerals only, but afterward in the amphitheater, where they lost all religious character. The first one occurring in Roman history was between three pairs of gladiators, arranged by Marcus and Decius Brutus, on the death of their father in 264 B. C. The fashion rapidly spread, and it became the custom, especially during the last years of the republic, for public officers and candidates for popular favor to give free gladiatorial exhibitions to the people. But the emperors exceeded all others in the extent and magnificence of these spectacles. Julius Cæsar gave a show at which 320 couples fought; Titus gave an exhibition of gladiators, wild beasts and sea-fights which lasted 100 days, in which 10,000 men fought with each other or with wild beasts. Gladiators for the most part were prisoners taken in war, and slaves, with the worst classes of criminals. But in the times of the emperors freemen and men of broken fortune began to enter the profession; and later on knights and senators fought and even women. The successful fighter was at first rewarded with a palm-branch, but in later years it became the custom to add to this rich and valuable presents and a prize of money. When a gladiator was thrown down or disarmed, if the spectators turned up their thumbs, the vanquished man was to be spared, and if they turned them down, he was to be slain; or, as is more probable, if they turned their thumbs toward their breasts, he was to be stabbed, and if they turned them down, the sword was to be dropped. Many attempts were made to limit or stop gladiatorial

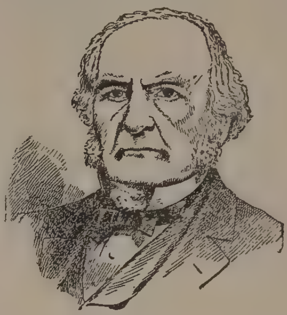
GLADIATORS

contests. They were finally stopped by the splendid daring of Telemachus, an Asiatic monk, who in 404 journeyed to Rome and there, rushing into the arena, strove to part two gladiators. The spectators stoned him to death, but the Emperor Honorius proclaimed him a martyr and issued an edict suppressing such exhibitions.

Gladi'olus, an ornamental plant of the iris family. It has beautiful spikes of flowers, sword-shaped leaves and a flattened solid bulb from which the stem grows. Sword-lily and corn-flag are names sometimes applied to these plants. There are both hardy and tender kinds. Several kinds are European, but the majority are from the Cape of Good Hope. They are raised from bulbs or from seed, and in this way many hybrids or mixed sorts have been produced. Among the tender kinds which are grown in pots in winter or planted in the open ground in spring, the most popular and brilliant are these hybrids. In size, beauty of form and variety of flower-coloring they far excel any of the other kinds and are constantly improving. The colors range from pure white through rose to crimson, scarlet and violet; some have yellow as the prevailing color; and some are variously striped, shaded and stained in the most brilliant combinations. See Robinson's *Flower-Garden.*

GLADIOLUS

Gladstone (*glăd'stŭn*), **Herbert J.,** M. P. for Leeds, West, in the English Parliament, is the fourth son of the late Wm. Ewart Gladstone, in whose last government he held office as Under Home-Secretary and later as First Commissioner of Works, besides acting for a time as private secretary to his distinguished father. In the Liberal ministry of Campbell-Bannerman, Mr. Gladstone held the portfolio of Secretary of State for Home Affairs: he also was a member of Lord Roseberry's ministry in 1904–05. Mr. Gladstone was born in London in 1854, and educated at Eton and at University College, Oxford. From 1877 to 1880 he was lecturer on modern history at Keble College, after which he went into politics during his father's régime, and successively became a junior lord of the Treasury, financial secretary in the War office and, finally, Under Home-Secretary etc. and member for Leeds.


WILLIAM E. GLADSTONE

Gladstone, William Ewart, a British statesman, author and orator, was born of Scottish descent at Liverpool, Dec. 29, 1809; and died at Hawarden Castle, May 19, 1898. He studied at Eton, and graduated at Oxford as double first-class, the highest honor and one rarely attained. He entered parliament in 1832 as a Conservative, and became known as a young man of brilliant promise. (Lord Macaulay called him "the rising hope of the stern and unbending Tories.") He was soon called upon to hold office. In 1834 he was made junior lord of the treasury, and the next year under-secretary for the colonies, by Sir Robert Peel, and the two men became close political and personal friends. Gladstone was not a member of the parliament during the period when England veered to free trade, but he was in favor of the new policy. In 1847, still a Tory, he was chosen one of the representatives from the University of Oxford. The death of Peel in 1850 brought Gladstone more directly to the front. His first great speech was made in answer to Disraeli, and from that hour he was recognized as one of the great historic orators of the English parliament. With that speech began the long parliamentary duel between these two masters of debate, which was carried on for twenty-four years. As chancellor of the exchequer, Gladstone made his first budget-speech, which which was said to be the finest explanation of financial questions ever made by a British statesman, and people came to look forward to these speeches with the same interest with which the performance of a great composer is awaited, In 1858 Gladstone was sent on a mission to the Ionian Islands, and about 1859 he became classed as an advanced Liberal. In 1865 the death of Palmerston made Gladstone leader of the house of commons

He now began to turn his attention to the distracted state of Ireland. In 1868 he became prime minister, and immediately a multitude of reform-measures followed. But by 1874 the wave of reform had subsided, the reaction came, and he resigned and retired from the leadership of the house of commons. For some time he occupied himself with literary and historical studies. But he was soon called back to power, and in 1880 again became prime-minister, and continued in office, with the exception of a brief period, till 1886. He conducted the nation through very serious times in her history. When, believing that the voice of the Irish people had declared in favor of home rule, he became the champion of that policy, a sudden and serious split took place in his party, and he was defeated. He, however, continued to lead the opposition in parliament. Under his leadership was formed the Gladstonian party which favored home-rule for Ireland. In 1892, on this issue, Gladstone again became prime-minister, resigning on account of age and failing health, March 2, 1894.

Aside from his fame as a statesman and an orator, Gladstone made a name in literature and scholarship. Among his works are *Juventus Mundi*, *The State in Relation to the Church*, *The Vatican Decrees*, *The Impregnable Rock of Holy Scripture*, *The Irish Question*, *Studies on Homer* and *Gleanings of Past Years*. See *Lives* by John Morley, Herbert Paul, James Bryce and G. Barnett Smith and Justin McCarthy's *History of Our Own Times*.

Glas'gow, a royal borough, the industrial center of Scotland and the most populous city of Great Britain next to London, stands on the banks of the Clyde, 42 miles west of Edinburgh. It extends about three and one fourth miles from north to south, and five from east to west. There are about 300 miles of streets; the Clyde is spanned by twelve bridges, of which three are railroad viaducts and two suspension bridges for foot-passengers. Of buildings possessing historical interest, there are none except the cathedral, which dates back to the 11th century, is especially noted for its beautiful crypt or underground chapel, and is unrivaled in Britain. Of modern buildings are the city-chambers; the royal exchange, a handsome building ornamented with colonnades of Corinthian pillars; and the numerous churches. In general, Glasgow is a well-built city; its streets are well laid out and spacious, and the houses which line them are solidly built of excellent stone, which is quarried in abundance near by. It is well-supplied with public parks, and in George Square are a number of statues—Watt, Scott, Burns, Livingstone and others. The University of Glasgow was founded in 1450. It now has 2,500 students, a teaching-faculty of 136 professors and tutors and a library of 200,000 volumes. Other educational institutions are the Glasgow and West of Scotland Technical College, with over 2,000 students; St. Mungo's; the Free Church College; and St. Margaret's College for women. There are two morning and three evening dailies, about a dozen weekly newspapers and periodicals; and one or two monthlies. Three magnificent railroad stations bring traffic to the heart of the city, and the under-ground railway and the city union line, besides the street railways, afford every facility for traveling into most parts of the city. Another means of transit is found in the fine fleet of river-steamers, which afford access to all the western highlands and islands. One of these steamers attains a speed of twenty-two miles an hour, and can accommodate 2,000 passengers on its daily journey of 160 miles. The Clyde has been a chief source of the great prosperity of Glasgow. It now allows ships drawing twenty-four feet of water to ride at anchor. The harbor and docks give the city a water-area of 210 acres. Beyond the harbor the principal feature of the Clyde is the great shipbuilding and marine engineering yards which line its sides. Here have been built such vessels as the *Etruria*, *City of New York* and *City of Paris*. Glasgow is built over a coalfield rich in seams of iron-stone, and the city has blast-furnaces within its bounds. The making of steamtubes, boilermaking, locomotive-engine building and general engineering are among the principal industries. The dyeing of Turkey-red has been greatly developed; and the chemical works and spinning and weaving industries afford employment to a great part of the population. Besides its cotton-mills, muslin-weaving and many textile-factories, the city has large calico-printing and bleaching-works, tobacco-works and distilling-establishments. Glasgow does not hold an important place in the early history of Scotland. The settlement by the Clyde goes back to about 560 A. D., when the half-mythical St. Kentigern or Mungo appeared as the apostle of Christianity to the rude Celts of that region, and built his little church where the cathedral stands. The place has some importance in religious history as the center of some activity during the time of the Covenanters. But its main fame has always been as an industrial and mercantile city, and its real history began about 1707, when the prospect of a great traffic with America aroused the commercial activity of its people. The population is now 784,455; and the area is about 12,400 acres. See MacGeorge's *Old Glasgow* and Muir's *Glasgow in 1901*.

Glass is a combination of silica with two or more alkalies, alkaline earths or other oxides, as lime and soda. In its ordinary state glass is a solid body with a luster, is more or less brittle, and is commonly transparent. When softened by heat, it may be easily molded into any shape; it welds when red hot; and at a lower heat it may be cut with knives and scissors. But molten glass can be rapidly drawn out into threads hundreds of feet long, and these when cooled can be woven into a beautiful silky fabric. The different kinds of glass are made of slightly different materials.

Window-glass including the crown, sheet and plate varieties, is made of silica, soda and lime; flint glass, often called crystal glass, of silica, potash and lead; and bottle glass, of silica, lime and alumina, with sometimes other materials added. Any of these kinds may be colored by the use of certain oxides of metals. Silica is found in its purest form in rock crystals; but all quartz, flint, sandstone and sand are made of it. Pure white sand is now generally used, the best in the world being found in Berkshire County, Mass.

The materials are sifted and mixed together, and then melted in large pots set into a furnace. These pots are made of clay, and about ten of them are placed in a furnace. Opposite each pot is a door through which the workman can fill it with material, and the pots are not taken out until used up, which happens after one or two months. The furnaces also, which are built of fire-proof bricks, are never allowed to cool until, after a year or two, they are worn out. To the other materials already in the pots about one fourth of their weight of broken glass is added; the furnace doors are closed and the fires raised to a white heat, which gradually melts the contents of the pots into liquid glass in about 24 hours. The heat is then allowed to go down until the glass becomes about as thick as paste, in which state it is kept while it is being used by the workmen.

If bottle glass is to be made, a workman now dips a long iron tube called a blowpipe into a pot, and takes up a "gathering" or enough material to make a bottle. Another workman brings this into a pear shape by slightly blowing and turning it on a stone or iron table, called a marver. The glass is now placed into a mold and made to fill it by blowing down the tube; the bottom is pushed up, and the ring around the mouth is made by the addition of a strip of metal. This process was formerly done by hand. When the glassblower has finished a bottle, it is immediately taken to the annealing oven, where it remains about 36 hours, while it cools very gradually to the ordinary temperature of the air. Articles made in this way, as wine-glasses, tumblers etc., are often subjected to the process of glass-cutting, which is really grinding. The glass is held against a cast-iron wheel upon which a thin stream of sand and water is dripping. The sand leaves rough marks on the glass, which are smoothed out on other wheels and finally polished on a wooden wheel with a soft powder made of the rust of tin and lead. Glass is sometimes engraved by means of the sand-blast. For making plate-glass, crown-glass and sheet or cylinder glass different processes are required. Stained glass, seen mostly in church windows, is made by painting the surface of clear glass with various materials, chiefly the oxides of metals mixed with oil of turpentine. The pictures are painted with brushes, and the glass is then heated until the colors become stained into it. Another kind, called mosaic-glass, is made of a great number of small pieces set in lead frames.

The invention of glass dates from the earliest times, and several nations claim the honor of its discovery. But it probably is due to the Egyptians, among whom glass is mentioned as early as 3300 B. C. They generally made it into beads, vases, small figures, etc. Next came the Phœnicians, and from these two centers the art spread into neighboring centers. Glass making was introduced among the Romans about the beginning of the empire, though glass had long been imported. As it declined in Rome with the decay of the empire, it was transferred to Constantinople, where it flourished during the dark ages. Next the Arabs obtained a knowledge of glass making, and the glass of Damascus became celebrated during the middle ages. Venetian glass also early became famous, and mirrors, goblets and cups from Venice were sent all over the world. Extensive glass works were soon in operation in Germany, France and Great Britain. The first attempt at the manufacture in the United States was at Jamestown, Va., in 1608, and others soon followed. The chief centers of the manufacture in the United States are Pennsylvania, New Jersey and New York. A large part of Pennsylvania glass comes from Pittsburg. Pressed glass is an American invention. With a few exceptions the United States is fully up to Europe in this industry. The production of all kinds in 1909 was $92,185,693. See Sanzay's *Marvels of Glass-Making* and Wallace-Dunlop's *Glass in the Old World.*

Glas'tonbury, an old borough of Somersetshire, England, lies on the River Brue, near Bristol. It is said that Joseph of Arimathea came here, bearing the holy grail, (the cup from which Jesus drank at the Last Supper), and founded the first Christian church in England. He planted his pilgrim's staff on Weary-all Hill, where it took root and blossomed every Christmas Eve. The massive Abbot's Kitchen, built in the 14th century, still stands. Population 6,500.

Glendower (*glĕn'dōōr*), **Owen,** a Welsh chief, descended from Llewellyn, the prince of Wales, was born in Montgomeryshire in 1359. He studied law, served under Richard II, and was body-squire to Henry IV. Shortly after the beginning of Henry's reign some of Glendower's lands were seized by a Lord Gray. After seeking redress from the king without avail, he took up arms independently, seeking to recover his rights and establish the freedom of Wales. He carried on this warfare for years, and in 1402 took Lord Gray prisoner, in the same year also capturing Sir Edmund Mortimer. In 1404 he formed an alliance against England with Charles VI of France, who in the following year sent troops to England. Glendower kept up this war all his life, and is believed to have died after 1415. See Shakespeare's *Henry IV*, Part I.

Glens Falls, N. Y., a town in Warren County, N. Y., on the Hudson River, 45 miles north of Albany and ten miles south of Lake George. It is reached by the Delaware and Hudson Railroad, and has a large trade in lime. It is notable for its splendid water-power, which supplies the town with its electricity and street-railway motor-force, as well as many of its manufactories with the power to run their machinery. It has a number of foundries, machine-shops, sawmills, paper-mills, brick, terra-cotta and lime-works. It has a number of seminaries for women, including the Glens Falls and St. Mary's academies. Population 15,243.

Gloucester (*glŏs'ter*), **England,** is situated on the left bank of the Severn River. It was the seat of a nunnery, a monastery and a great Benedictine abbey; the latter was suppressed in 1539, to become, two years later, the cathedral of Gloucester. This cathedral is one of the largest and most notable in England, measuring 420 feet by 144. Its tower rises 225 feet, and contains the bell, Great Peter, weighing over three tons. The city has been the seat of eight parliaments. It has grown into a great commercial port, while its manufactures have somewhat declined. Population 54,683.

Gloucester, Mass., a city situated on the southern side of Cape Ann, founded in 1623; incorporated as a town in 1642; and as a city in 1873, is the leading fishing-port of the New World, being also a port of entry. Six thousand men, manning more than 300 vessels, are engaged in catching fish. Other important industries are granite quarrying, shipbuilding and the manufacture of shoes, boxes, isinglass, glue and also of articles relating to the fisheries. Three daily newspapers, a board of trade, a master-mariners' league and a business men's association are among the lively evidences of the enterprising spirit pervading the community. The city has ready communication with Boston by steamship and railroad, an average of two steamers and ten trains running daily each way. As a summer resort, the vicinity of Gloucester furnishes some of the most attractive places along the New England coast,— notably, Magnolia, Eastern Point, Bass Rocks, Long Beach and Annisquam. The city has 22 schools, with 5,000 pupils and 133 teachers. Population 24,398.

Glove, the article worn to cover and protect the hand, has a history of interest. It was used in early times, and carried with it many meanings and uses. We are told that Laertes, the farmer-king, wore gloves to protect his hands. The Persians were laughed at for wearing them to keep their hands warm. In the Stoic days of Greece and Rome the glove was looked upon as womanish, but later came into use. In the East it was used to pass the title to property, the exchange of the glove carrying possession of the property. In ancient times a challenge to fight was made by throwing down the glove. It became an almost necessary part of dress in England about the 14th century; and during the Elizabethan period gloves were made with gauntlets, on which much rich embroidery was worked. See *Gloves, Their Annals and Associations* by Beck.

Gloversville, N. Y., a city in Fulton County, central eastern New York, on the Cayadutta branch of the Mohawk River, 53 miles northwest of Albany. It is on the Fonda, Johnstown and Gloversville Railroad, and is connected with the New York Central and West Shore roads and with the Erie Canal at Fonda. It has many extensive glove-manufactories, being the center of the United States glove-trade; it does a large trade also in the manufacture and preparation of shoe-leather. It has many good schools and churches, and the Nathan Littauer hospital and a Parsons free library are among its prominent institutions. To its large trade in gloves it owes its name. Population 20,642.

Glowworm, the name applied to larvæ and wingless females of certain beetles belonging to the firefly family. They all have the power of emitting light from spots on the abdomen. These spots are yellow by daylight but luminous in the dark. The light, however, is not constant but interrupted; it seems to depend upon the action of oxygen upon a substance produced within the cells that make up the light-giving spots. At all events the light is not due to phosphorus, as is commonly believed. See FIREFLY.

Gluck (*glo͝ok*), **Christoph Willibald** RITTER VON, the first among great modern opera-writers, was born in Bavaria July 2, 1714. He gave no indications of musical genius until, while at the University of Prague, he was forced to teach music to make both ends meet. At last, at 22, he decided to follow the profession, and went to Vienna. Here he was much patronized, and in 1741 he wrote his first opera and six others in the next four years. In 1745 he was called to London by Lord Middlesex, and while there Handel said of him that his music was "detestable." He afterward produced operas in Rome and Naples, being made a Knight of the Golden Spur by the pope, but his triumph was in the production of his *Orphée*. He died of paralysis at Vienna, Nov. 15, 1787.

Glu'cose, Dextrose or **Grape-Sugar.** In chemistry the term glucose is used for a number of sugars occurring in fruits or made from starch, but in popular language it is restricted to the products made from starch, which are most familiar in the form of syrups. In the United States starch-sugar is made from corn, but in Europe the starch from potatoes or rice is used. The usual process is to soak the corn, when that is used, in warm water for three or four days, renewing the water so as to soften the corn without souring it. It is then ground and mixed with water, the thin paste thus made carried through sieves and cleansed with alkali, and the starch finally separated from the water. A bushel of corn makes about 30 pounds of starch. The starch is now ready for what is called conversion, the process by which it is converted or changed from starch to sugar. The starch mixed with water, which has been made acid, usually by the use of sulphuric acid, is boiled for some time; the sulphuric acid is removed by adding chalk; and the liquid is filtered several times. The result either is a clear syrup or a syrup which yields solid glucose when cooled. The clear syrup is the glucose that is used in trade, while the other product is known as grape-sugar, because it is the same sugar as that found in grapes and other fruits. Glucose is used instead of malt in brewing; instead of sugar in canning fruits and making jellies and candy; for making artificial honey; and for adulterating sugar. It is about two thirds as sweet as cane-sugar, and is a cheap and healthful food if properly prepared. In Germany there are about 40 factories, and in the United States about 30, engaged in the manufacture of glucose.

Glumes (in plants), the prominent and characteristic bracts connected with the flower clusters of grasses. See GRASS.

Gnat, a name loosely applied to any one of a group of two-winged insects, including the mosquitoes, midges, buffalo gnat, gall gnat and others. The gnats and midges are mosquito-like in appearance, and commonly mistaken for them. The true mosquitoes are separated from others by having fringe-like scales on their wings and by developing always in the water. See MOSQUITO for life-history and other facts.

Gneiss (*nīs*), a compound of quartz, felspar and mica. This combination occurs in layers of varying thickness, from a mere line to a foot.

Gnostics (*nŏs'tĭks*) [from a Greek word meaning *knowing* or *sagacious*], a term applied to rationalistic or heretical sects in the early Christian church. Their doctrines were a mixture of Greek idealism, oriental pantheistic naturalism and Christian revelation. They held that all natures, intellectual and material, are derived from the deity by successive emanations, which they called *eons*. Christ they deemed a superior *eon*, who had come to the earth to subdue the god or *eon* of this world. They set a higher value upon knowledge than upon faith; thus their view of Christianity was not spiritual, but speculative. Christ's humanity many of them treated as an illusion; nor did they quite believe in his divinity. Their canonical books have little in common with those of the Christian scriptures. Of the gnostics there were more than 50 sects in apostolic times and in the 2d century, when they chiefly flourished.

Gnu, a member of the antelope-group, inhabiting South Africa, with horns bent downward over the eyes and abruptly upward. This animal has an ass-like mane and a horse-like tail. It sometimes is erroneously called the horned horse, but the hoofs are cleft like those of cattle, and it is not closely related to the horse. It is about four feet high and nine long, with a brownish skin. These animals live in herds of from ten to 50. There are two kinds: the common gnu and the brindled gnu; the latter is slightly larger, has horns more like an ox, and has black stripes on the neck and shoulders.

GNU

Goat, a cud-chewing animal related to the sheep, but easily distinguished by having horns wider from before backward, instead of from side to side, like sheep, usually with a beard on the chin and a strong odor. There are numerous varieties both wild and domesticated. The genus (*Capra*) to which they belong includes ibexes and goats proper. Wild goats orig-

ANGORA GOAT

inally were mountain animals. They are found now in Asia and southern Europe. Those of Asia Minor are either solitary or in herds of 30 or more. The female has no beard and shorter horns — being about a foot long — while those of the male reach a length of three or four feet. The original stock of the tamed goats is uncertain. It is likely that they came from the Persian goat or Paseng, but some naturalists think that the wild goats of Tibet and Cashmere come closer to the tame ones. The Angora goat (see illustration), originally of Asia Minor, has long spiral horns and abundant silky hair. Its fleece, called mohair, is in great demand, and the animal is regarded as of high value in various ways. The raising of Angora goats has recently risen to quite an industry in this country on the Pacific coast, and interesting experiments have been made in some of the states of the middle west. There are many breeds of the domestic goat raised for their milk, flesh, skin and wool. The goat of Cashmere and Tibet supplies exceedingly fine wool, used in making Cashmere shawls and other fabrics. Other common varieties of wool-bearing goats are the Nubian and Maltese. The hides of young kids are extensively used for gloves, though much of the so-called kid-leather is an imitation, made from the skins of rats, dogs, etc. See Pegler's *Book of the Goat* and Farmer's Bulletin No. 137, U. S. Department of Agriculture.

GOAT OF CASHMERE

Gobi (*gō′bē′*), **Desert of,** or **Shamo,** in China, is a dry area of plateau lying between the Khingan and Sin-Kiany Mountains. It thus covers a great part of Mongolia. Across this desert lies the great caravan-route between China and Siberia (see CARAVANS). The population consists of nomadic Tartar and Mongol tribes, who pasture their sheep, horses and camels upon the scattered herbage which the desert affords. At times, when rain has recently fallen, this desert takes on an air of great fertility and beauty, being speedily covered with long grass and flowers.

Godavari (*gō-dä′vȧ-rē*), a holy river, one of the principal streams of India and the largest in the Deccan, rises near the Indian Ocean and flows 898 miles into the Bay of Bengal, which it enters by seven mouths. The beautiful scenery has won it the name of the Indian Rhine. From it branch three canals, irrigating over 528 miles of channel and all along its lower course making the country one of great richness and fertility.

Goderich. In Ontario, a town of 5,000, the most important port on Lake Huron. It is the terminus of the Buffalo and Lake Huron Division of the Grand Trunk Railway. It has extensive salt-works, soap-works and flour-mills. Its trade in fish is considerable. A very popular summer resort.

Godfrey of Bouillon (*bō-yôn′*), a crusader and Christian knight, was born at Baisy, Belgian Brabant, about 1061. He served with great credit under Henry IV of Germany in two of his campaigns. He joined the first crusade and was elected one of the principal commanders. A few days after the capture of the Holy City, he was proclaimed king by the army, but refused to wear a crown where his Savior had worn thorns, and took the title of Defender and Guardian of the Holy Sepulchre. In 1099 he defeated the sultan of Egypt on the plain of Ascalon, thus gaining possession of almost the whole of Palestine; but after a year he died at Jerusalem on July 18, 1100.

Godiva (*gō-dī′vȧ*), **Lady.** See COVENTRY.

God Save the King. Commonly ascribed to Henry Carey, who first sang the anthem on a public occasion in 1740. Carey's claim to the authorship of this piece has never been satisfactorily established. But see Dr. W. H. Cummings' book, *God Save the King*, London, 1893, for latest investigations. During the Scottish Rebellion, in 1745, it was publicly sung at the theaters and became well-known. In October of the same year both words and music were printed in *The Gentlemen's Magazine*. The tune has some resemblance to an air of Dr. John Bull's, dated 1619; to a Scotch carol, 1611; to a ballad, *Franklin is Fled Away*, 1669; to a *Lesson* of Henry Purcell's, 1696; to an old anthem, sung at St. James (Catholic) Chapel; and to other compositions less known. In Denmark the tune has been used for the national song, *Heil dir im Sieger Kranz!* Both words and music have been adopted by Prussia and Germany for the same purpose. The tune has been used by Weber in a cantata and in his *Jubel Overture;* by Beethoven in his *Battle-Symphony* and for a set of piano variations; by Attwood in the coronation anthem of George IV; and by Rink in his *Organ-School.* See AMERICA.

Goethals (*gō′-thălz′*)*. **Colonel George W.,** Chief Engineer of the Panama Canal (*q. v.*) was born in Brooklyn, June 29, 1858. He graduated from West Point in 1884, and later from the engineering school of Willet's Point, New York. Before being appointed to the position in which he won international fame as an engineer and civil administrator in the Canal Zone, he had shown his fitness for his great task in the conduct of engineering work for the War Department in various undertakings, including the construction of the Colvert canals in the Tennessee River. He was made Chief Engineer of the First Army Corps in 1898, and later Chief Engineer of the Panama Canal and Chairman of the Isthmian Commission. He was appointed first governor of the Canal Zone.

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*Commonly pronounced *gu tȧlz′*. Colonel Goethals states the correct pronunciation is as here given.

Goethe (*gẽ′tĕ*), **Johann Wolfgang,** was born at Frankfort-on-the-Main, Germany, Aug. 28, 1749. His boyhood was passed amid pleasant surroundings in study and play until 1765, when he was admitted to Leipsic University. Here his time was given, not so much to the more serious studies, as to art, music and drama, and his first drama in verse, *The Humors of a Lover* (1767), was dedicated to the girl whom he loved. In 1768 he returned to Frankfort sick, and for almost a year he remained an invalid. He sought the consolations of religion, and began the study of alchemy during this illness, continuing this study after his arrival at the University of Strassburg. He received his degree, returned to his native city, but could find no pleasure in the practice of law. While at home he wrote *The Wanderer* and *Wanderer's Storm-Song.* In 1773 he finished *Prometheus* and in 1774 *Erwin und Elmire,* his wonderful work *The Sorrows of Werther* and the tragedy *Clavigo.* He removed to Weimar upon the invitation of the young Duke of Weimar, and in 1776 was made a member of the privy council. After ten years of public labor, during which he wrote very little, he went to Italy for rest, only revising his former work, and *Egmont* and *Iphigenia* were completed, besides some touches being added to *Faust.* The first part of *Faust* was published in 1808. He was greatly interested in science, and among his works are many essays upon botany and other scientific subjects, which are of permanent value. He died at Weimar, March 22, 1832. Goethe is the greatest of German authors, and one of the great poets of the world. His *Faust* has been ranked by scholars with *Hamlet* and *Job* — "the three greatest tragedies." Goethe was a noble-looking man both in youth and in old age. His influence has touched every civilized people, and seems still growing. See *Life* (in English) by Düntzer, by Geo. H. Lewes and by Bielschowsky.

Gog and Magog, names several times used in the Bible and given to the famous figures of the two giants in Guildhall, London. In *Genesis* Gog is mentioned as the son of Japhet, and in *Ezekiel* he is spoken of as prince of Magog, united with others against Israel. In *Revelation* they appear as standing for all enemies of the Kingdom of God. Those in the Guildhall are supposed to be the images of the last two of a race of giants who were conquered by Brut.

Golcon′da, a fortress situated in Hyderabad, India, near which are the ruins of the capital of Golconda, which fell about 1687. The fort is held by a small garrison and serves as a treasury of the Nizam. Golconda is popularly famous for its diamonds, but as a matter of fact they were only cut and polished there.

Gold, on account of its beautiful color and since it does not become tarnished or corroded in use, is considered the most precious of metals and is used as the principal basis of value throughout the civilized world. It has been known from time immemorial, and is found in many parts of the world.

It is usually found in the metallic or native state in the form of nuggets or smaller particles, in sand or gravel or distributed through rocks or veins. Nuggets weighing as much as 1,000 ounces have been found. Native gold always contains some silver. The metal is also found in combination with tellurium as telluride ore, and it frequently accompanies copper ores and iron pyrites. The extraction of gold from sands or gravels, called alluvial or placer mining, is accomplished by washing with water in various ways. The heavy gold sinks to the bottom when the material is stirred up with water, and mercury (quicksilver) is usually used to amalgamate the gold and hold it. Solid ores have to be reduced to powder by stamp-mills or other devices before the gold can be extracted, and sometimes they must be heated to redness (roasted) to drive off tellurium or other things. One of the modern methods of extracting gold from ores consists in dissolving out the metal with water containing potassium cyanide. This is known as the cyanide process. Gold is the heaviest of all the familiar metals except platinum. It is more than 19 times as heavy as water. In malleability it stands first among the metals, being capable of being beaten to a thickness of $\frac{1}{250,000}$ of an inch and ductile enough to be drawn into a wire 500 feet long and weighing only one grain. It may be alloyed with other metals to change the color for designs. The best known alloy of gold is that with copper, which is used for gold coins. The chief gold-discoveries have been in California, 1848; Australia, 1851; British Columbia, 1858; New Zealand and Nova Scotia, 1861; South Africa, 1868; West Australia, 1870; South Australia, 1886; Alaska and Klondike, 1896. In 1909 the world's production of gold was 454 million dollars, of which the U. S. yielded 99 millions in value.

Gold Coast, a crown-colony of Britain lying along the Gulf of Guinea, on the west coast of Africa, of an area, including Ashanti and the protectorate, of about 82,000 square miles and an estimated population of 1,502,899. It has a coast line of about 350 miles. Ashanti (capital Kumasi), part of the protectorate, formerly gave the English great trouble to pacify the natives.

There have been a number of revolts, the last occurring in 1900–01. Its exports are mainly palm-kernels and oil, india-rubber, gold dust, ivory and monkey skins. Gold is mined by Europeans. In 1910 the output of gold amounted to nearly four million dollars. The climate is very unhealthy, and the inhabitants are chiefly negroes. The chief towns are Cape Coast Castle (population 11,364) and Accra (population 19,585). See *The Siege of Kumasi* by Lady Hodgson.

Golden Age, a term used to describe a period of great prosperity and happiness. Many nations use it to describe the early ages, in which happiness and innocence were thought to have been universal, the traditions of such a period being very common. In Roman literature the golden age was the period from 250 B. C. to 14 A. D., when Livy, Cicero, Ovid, Terence, Cæsar, Sallust, Vergil, Plautus and Horace flourished. The reign of Queen Anne in England is often called the golden age of English literature, with such writers as Dryden, Pope, Addison, Steele, Johnson and Gay. The term is also referred to a future period of prosperity, intelligence and purity — the dream of all mankind.

Golden Fleece, in Greek story the fleece of the ram Chrysomallus, to recover which the famous expedition of the Argonauts set out. The name was given to a celebrated order of knighthood of Austria and Spain, founded by Philip III in 1430. It was instituted for the protection of the church, and the number of its knights was 31, who themselves filled vacancies by vote. In 1713 there was a dispute between Charles VI of Austria and Philip V of Spain for the sole right of conferring the order, but it was settled by giving it to both. The sign of the order is a golden fleece, hanging from a gold and blue enameled flint stone, emitting flames and borne by a ray of fire.

Golden Gate, a passage, one mile wide, forming the entrance to the bay of San Francisco. It is defended by two forts, one outside and one inside.

Gold'enrod, the popular name of a species of *Solidago*, a genus belonging to the composite family. There are about 85 species of goldenrod, most of which belong to North America. They are autumn bloomers, and their characteristic masses of small yellow flowers are prominent features of autumn vegetation. They are associated in relationship and in season with the asters. Being so distinctly a North American flower, the goldenrod is favored by many for adoption as our national flower. In its various forms it adapts itself to all conditions of soils and climates here existing. Only two or three species belong to Europe, but several of our species are carefully cultivated there in gardens. The plant has a prolonged season of blooming; the conspicuous flowers and the ease with which nectar and pollen are to be obtained from them attract many insects. The stem usually is simple and unbranched, resembling a rod; the leaves are generally sessile, long and narrow; the florets grow in clusters along the stem. The flowers have rays, and all the many kinds save one are yellow. This exception is the whiterod or silverrod, its florets being cream-white.

Goldfinch, a small bird with golden plumage, common in the United States and other countries. It is about five inches long, with a cone-shaped bill; in the summer the male is yellow, with a black crown, and wings and tail black and white. This bird and the yellow warbler are often called the yellow bird. It feeds on seeds, especially of the dandelion, thistle and sunflower, and is called the thistle bird. The goldfinches remain over winter in many parts of the United States, but with duller plumage, being grayish brown above with a yellow crown, the under parts a soiled white, and throat yellow. The name is also applied to an European finch that is common in gardens and is a favorite cage-bird. The latter have the forehead and throat blood-red, and a patch of brilliant yellow on the wings. The goldfinch is a gentle, sociable, happy bird; its call cheery; its summer song a flood of melody.

Goldfish, a small ornamental carp, artificially bred in aquaria throughout the world. It originally was a Chinese fish of an olive-green color, but by breeding golden and silver varieties have been produced. Those that have escaped from the fountains in Washington into the Potomac River have produced young that return to the original greenish hue.

Gold'smith, Oliver, the son of a curate, was born in County Longford, Ireland, Nov. 10, 1728. He went to school in the neighborhood and then to Dublin as a free scholar. Here he took part in a college riot and ran away, but his brother arranged matters for his return and he took his degree in 1749. He was intended for the ministry, but the bishop rejected him, and he set out for America, getting no farther than Cork, however, where $250 was given him to study law in London. This he lost in gambling at Dublin, and set out for Edinburgh to study medicine. Unsuccessful in this, he set forth upon a foot-tour through Holland, France, Germany and Italy, returning to England in 1756. He now tried several occupations, all without success. Here appeared his first work, under an assumed name — a translation of *Memoirs* of Jean Marteilhe of Bergerac. In 1759 he published his *Enquiry into the Present State of Polite Learning in Europe*, and began writing for *The Bee*, *The Busybody* and the *Ladies' Magazine*. In 1760–61 appeared his celebrated *Chinese Letters*, republished as *The Citizen of the World.* The next year he published the *Life of Richard Nash* and sold a one third share of his unpublished *Vicar of Wakefield.* In 1764 he earned fame as a poet by his *Traveler*, and two years later the *Vicar of Wakefield* brought him renown. The drama was yet untried, but, before his immense success with *She Stoops to Conquer*, he published his greatest poem, *The Deserted Village*, in 1770. He died at London, April 4, 1774. See *Goldsmith*, in English Men of Letters Series, by Wm. Black.

Golf. An outdoor game, claimed to be of Dutch origin but played in Scotland previous to 1457 and now popular throughout all parts of the British Empire and the United States.

It is played on rather extensive and somewhat prepared grounds called links. The links consist essentially of a course with artificially constructed holes four and a half inches in diameter at intervals of from 100 to 500 yards, each hole surrounded by a smooth surface of ground about 30 feet in diameter called a "putting-green." The object of the game is to drive the small, hard ball, by means of clubs, successively into the 18 holes making up the entire length of the course, in as few strokes as possible. The best ground for a links is a stretch of undulating land or sandy soil covered with short grass. Preferably it should have a number of small streams, holes, gullies, ridges or other natural obstacles and irregularities called "hazards." Much of the skill required in the game consists in so driving the ball that it will not be landed in places where its further progress will be interfered with by these hazards. In case there are not enough natural hazards in the course, artificial ridges called bunkers may be erected at different places along the course. The smoothed surfaces called putting-greens, surrounding each of the 18 holes, are for the purpose of preventing any interference with accurate "putting" for the hole in the center, after the ball has been landed upon the putting-green. A special club called a putter is used for this purpose.

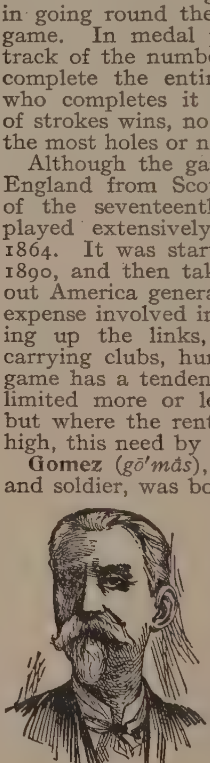
Most players use six or eight different kinds of clubs, each adapted for its own particular kind of stroke. The clubs have a strong, slender handle about three feet in length, often made of hickory, and a strong wooden or iron head with which to hit the ball. In beginning a game, and also in starting out for another hole after one hole has been reached, the ball may be placed upon a little elevation of sand or cone of india-rubber. to give the player a chance to get a good square hit at it. This little elevation is called a "tee." In knocking or "driving" a ball from a tee, a club called a driver is usually used. It has a long handle and a wooden head, and is especially adapted for driving the ball a long distance. Two hundred yards is considered a good drive. Should the ball get into a slight depression along the course, a club called the brassy, very much like the driver but rather better adapted for raising the ball, is generally used. Its head is tipped with brass. There are various other clubs, such as the mid-iron, cleek, mashie, lofter, etc., especially adapted for extricating the ball from long grass ruts, etc. or for lifting it so as to land it accurately in a certain spot, rather than to drive it a long distance.

The balls are now made for the most part of gutta-percha. They are 1¾ inches in diameter, hard enough not to be easily cut by the clubs, and heavy enough to carry a long distance.

There are two principal methods of scoring, namely, by match play and by medal play. In match play the players drive in turn from the tee at the starting place, and the stroke is then taken by the one whose ball is farthest from the hole aimed for, until all the players have "made" the hole, that is, played their ball into it. The player making the hole in the least number of strokes wins the hole, and the one who wins the greatest number of holes in going round the entire course wins the game. In medal play each player keeps track of the number of strokes he took to complete the entire course, and the one who completes it with the least number of strokes wins, no matter whether he won the most holes or not.

Although the game was introduced into England from Scotland in the early part of the seventeenth century, it was not played extensively in England till after 1864. It was started in New York about 1890, and then taken up rapidly throughout America generally. On account of the expense involved in providing and in keeping up the links, in paying caddies for carrying clubs, hunting up balls, etc., the game has a tendency in some places to be limited more or less to wealthy persons; but where the rent of suitable land is not high, this need by no means be the case.

Gomez (*gō'mās*), **Maximo,** Cuban patriot and soldier, was born at Bani, San Domingo, Aug. 25, 1826, of Spanish parents, and early in life served in the Spanish army. In 1868, when the ten years' war in Cuba broke out, he ranged himself on the insurgent side, and on the death of General Agramonte commanded one of the departments into which the island was divided, and fought at Las Guasimas. In


MAXIMO GOMEZ

1895, when the new struggle broke out, he with Antonio Maceo led the insurgent ranks, captured Fort Jaruco and destroyed it, and strove to make Cuba a desolation to the Spanish. Gomez, who among his fellow-patriots had the reputation of being an able soldier and clever strategist, spent much time in exile. He died on June 17, 1905.

Gom'pers, Samuel, president of the American Federation of Labor, was born in London, England, Jan. 27, 1850, where he received his education at a night-school. He learned two trades, working first as a shoemaker and afterward as a cigarmaker. Early in his career he came to this country, where he became a zealous advocate of the rights of labor and interested in efforts looking to the ameliorating of work-people of every class. He was one of the founders of the Federation, and has been continuously its directing spirit. He has edited the official magazine of the order, *The American Federationist*, and done much by pen and voice to aid labor-movements in America.

SAMUEL GOMPERS

Gonsalvo de Cordova (*gôn-säl'vô dȧ kôr'-dô-vä*), **Hernandez,** a great Spanish general, styled The Great Captain, was born near Cordova, Spain, Mar. 16, 1453. He served against the Moors and Portugal. For his masterly services against Boabdil, king of the Moors, Spain granted him a pension and a large estate. He was next sent to aid Ferdinand II of Naples, and conquered the greater part of the kingdom, with Ferdinand completely driving the French from Italy. On his return to Spain in 1498 he was rewarded by being made Duke of San Angelo. He again set out for Italy, wrested some cities from the Turks, and in 1503 completely defeated the French. He was made viceroy of Naples, but was recalled to Spain and fell from favor. He died on Dec. 2, 1515, at Granada. See Prescott's *Ferdinand and Isabella.*

Good Friday is the name of the Friday before Easter, so named to commemorate the crucifixion of Christ. In the Roman church it is observed by a solemn service, the worshipers approaching the cross on their knees to kiss the image of Christ. It is also observed by the Episcopal church.

Good'rich, Samuel Griswold, an American author, known best by his pen-name of Peter Parley, was born at Ridgefield, Conn., Aug. 19, 1793. During 1828–42 he published *The Token* in Boston, contributing tales, poems and essays. He published some two hundred volumes, mostly for the young. He died at New York, May 9, 1860.

Goodyear, Charles, was born Dec. 29, 1800, at New Haven, Conn., failed as an iron-manufacturer in 1830, and in 1834 turned his attention to perfecting a method of making rubber, which before his era always softened in warm weather. After much ridicule and suffering he succeeded, and in 1844 took out a patent for vulcanized rubber. He continued to find new uses for rubber, until it required sixty patents to cover his inventions, besides gaining for its inventor prize-medals and the cross of the Legion of Honor. He lived to see vulcanized rubber used in over five hundred ways, and its manufacture giving employment to over 60,000 workmen in the United States, France, Germany and England. He died at New York, July 1, 1860. See Pierce's *Trials of an Inventor.*

Goose, a bird with webbed feet, belonging to a group embracing swans and ducks, but commonly larger than a duck and smaller than a swan. The Canadian goose is the kind commonly seen in the United States, the birds that, in passing over, fly north in the spring and south in the fall in V-shaped order, led by an old gander. It usually breeds in the northern portion of the continent, but has been known, rarely, to breed within the limits of the United States.

GRAY-LAG GOOSE

The Canada Goose is also called Wild Goose, Gray Goose and Honker, its mellow honk, honk a familiar sound. It is very large, from 36 to 43 inches in length, its head and neck are black, the plumage grayish-brown above, pale gray beneath. Far from haunt of man, in deserted osprey's nest in tree-top, or in remote marsh or on wide plain the Canada Goose lays her eggs, buff-colored, four or five in number. The Canada Goose is the most abundant of all the wild geese. The Gray-Lag Goose (see illustration) is the corresponding European form and is regarded as the wild stock from which tame geese have been derived. The American White Fronted Goose, Prairie Brant, Gray Brant or Laughing Goose, is a wild goose familiar on the Pacific coast and in the interior, but rare in the east. It migrates in the spring and autumn, utters a resounding cackle. The Snow Goose, a splendid bird but fast disappearing, very rare in the east, is clothed in plumage all snow-white save for gray wing-coverts and blackish wing-tips. It migrates in spring and fall. The Brant or Barnacle Goose is common on the Atlantic coast. The upper plumage is black and brownish-gray; lower breast whitish, upper part of breast black. It is fond of the sea, usually migrates over the water, is seldom seen far inland. At low tide the birds wade about the marshes feeding, the young ones eagerly hunted by the sportsmen. A very similar bird, the Black Brant, belongs to the west.

Goose'berry. Plants which, associated with currants, form the genus *Ribes*, which contains about 60 species, chiefly natives of north temperate regions. Over 50 species are found in North America, about 40 of them being western. The gooseberry is said to have been cultivated for only about 300 years, and chiefly in England, where numerous magnificent varieties have been developed. In America their culture has been much neglected. There are two general types in cultivation: The European (*R. grossularia*), with thick glossy leaves and large variously colored fruit; and the American, with thinner leaves and small reddish-green fruit shading to purple.

GOOSEBERRY

Goph'er, a small burrowing rodent, the name used differently in different localities. Gophers do much damage to vegetation, and are considered a great pest by the farmers. The Red Pocket-Gopher commits its depredations in the fertile prairie region of the Mississippi Valley. It is about as long as a small rat, the body considerably thicker; in the skin of the cheek is a large pocket or pouch in which to carry its store, on each forefoot a set of long claws. The word gopher is a corruption of the French *gaufre*, meaning honeycomb. Natural enemies are the weasel and the gopher-snake. Farmers try to keep their numbers down by traps and poison. The name gopher is applied also to the ground squirrels, the spermophiles (seed-lovers); a familiar species is the little animal whose back and sides are marked with stripes of dark brown and yellow, the brown stripes having conspicuous yellow spots. It ranges north into Canada, south as far as Texas, but is not found west of the Rockies. It burrows into the earth below the frost line, carries seed in its pouches for storing in its burrow, and sleeps during the coldest weather.

Gor'dian Knot. The Phrygians, looking for a king, were told by the oracle of Delphi to choose the first person riding in an ox-cart toward the temple of Jupiter. This person was a poor peasant named Gordius. He dedicated his oxen and cart to Jupiter, and tied the yoke with a hard knot, and the oracle declared that whoever should unloose the knot would be ruler of Asia. When Alexander the Great came to Gordium, where the oxen were, he cut the knot with his sword and applied the prophecy to himself.

Gor'don, Charles George. England's glory and England's shame is "Chinese" Gordon, "Gordon Pasha," "Gordon the Christian Hero"—England's glory that it gave such a man birth and had his life-long, devoted service, and England's shame that she sent him to his death. It was a nation's criminal blunder that left him to perish at Khartum, and the nation paid for it with fifteen years of warfare with savage fanatics, thousands of lives and hundreds of thousands of treasure.

Son of Lieut.-Gen. Henry W. Gordon of the royal artillery, this modern Sir Galahad of stainless fame was born at the military post at Woolwich, England, Jan. 28, 1833. At twenty-one, as a lieutenant in the royal engineers, he was in the Crimea. In the battle of Balaklava, famous for the charge of the light brigade, young Gordon won British and Turkish medals and the French order of the Legion of Honor, for conspicuous bravery, together with the rank of captain. In 1860 he commanded the royal engineers in the allied armies in China and was made a brevet-major. Then he was called to Shanghai to help defend that British post against the Taiping rebels. The rebellion was of so barbarous a character and the Chinese government so helpless, that the British in Shanghai raised an army at their own expense and placed Gordon in command of it. Governor Li Hung Chang, the great Chinese statesman, created him a mandarin. After two years' hard fighting in 30 battles, the rebellion was stamped out, but it sprang to life again when Governor Li treacherously murdered the leaders who had surrendered under Gordon's promise of amnesty. Governor Li had to publicly acknowledge responsibility for this act, and promise to abide by Gordon's terms, before that Christian hero would again take the field. He rode always at the head of his troops, his only weapon a small cane of light wood. He was never wounded and he was believed to bear a charmed life from his magic wand. Surrendered rebel bands enlisted under his banner. He wore the yellow jacket and peacock feather and had the highest military rank in China. The rebellion was crushed, and "Chinese" Gordon went back to England with world-wide fame, but as poor in pocket as when he entered China. The 10,000 taels in silver sent him by the emperor he turned over to the British Museum. They lie there to-day, in a glass case, a pile of tarnished coins, beside his maps of the campaigns, his jacket and feather. The act was typical, for he ever treated money and honors with contempt.

The next six years he spent in routine duty at Gravesend, constructing engineering works on the Thames and spending his pay on the poor and sick. He was unmarried, but he kept up a home where he housed many a river waif and fitted him out for the sea or a trade. In 1874 he went out to Khartum as governor of the equatorial provinces of Africa which belonged to Egypt. He opened a mail route from Cairo to Albert Nyanza (2000 miles), fortified posts and placed Egyptian garrisons in them and tried to break up the slave-trade. To this end the Khedive added the Sudan to his dominions. He made himself personally known in all that vast region. The slave-trader feared him; fanatic Moslem chiefs loved him. A son of the desert he learned to live in tents and to sleep on the backs of camels. When satisfied that the slave-trade was carried on by connivance with the government at Cairo, he resigned, rebuking the Khedive as he had Governor Li.

At fifty he was back in London, a major-general, unemployed. Commissions were offered him in China, in Cape Colony, in the Congo State. He resigned them all when, matters having become intolerable in Central Africa, the British Government demanded that Egypt should withdraw and turn the Nile provinces and the Sudan over to England. There was but one man in England for the task of subduing and ruling that vast kingdom of sand. Gordon had been gone several years. He was not forgotten, but a new leader had appeared in the Mahdi, and England was not prepared for the task she so lightly undertook.

Gordon arrived in Khartum in February of 1884 without troops. He got 2,500 Christians down the Nile to safety before he was shut in. The siege began in March. In April the telegraph wires were cut. In that month a relief expedition was talked of in Parliament, but nothing was done. The Nile rose to summer flood and slowly subsided. With no more than a dozen European assistants, Gordon turned river steamers into ironclads, laid mines, strung wire entanglements, executed sorties, kept up the spirits of the besieged, baffled fanatic foes for ten months. The sun burned above shrinking river and lost leagues of shimmering sand. Famine and pestilence walked in the doomed city; the grip of fanatic foes tightened. To this day the silence, the indifference, the paralysis of the government are inexplicable. For months England abandoned her best defender.

Lord Wolseley left London in September, but the delay was fatal. The Nile had gone down and boats went aground on the shallows. Khartum fell on the 26th of January, 1885; the relief arrived on the 28th. A general massacre had taken place, and Gordon's head was carried to the Mahdi's tent. No trace of his body was ever found. His diary and last letters were recovered. In one to his sister he said: "It must soon be over. I am quite happy. I have tried to do my duty." Not a word of reproach or complaint. Numerous monuments have been erected to him, but his best memorials are Gordon College in Khartum and the Gordon Boys' Home in London. The Sudan was not conquered until 1900. (See KITCHENER). Tennyson wrote the epitaph for the tomb in Westminster Abbey. See *Chinese Gordon* by Archibald Forbes and *Life* by H. W. Gordon.

Gordon, Charles W. (Ralph Connor), was born at Indian Lands, Glengarry, Ont., in 1860, the son of a Presbyterian clergyman. He was educated at the University of Toronto, Knox College, Toronto (in theology) and at New College, Edinburgh. He was missionary in the Rocky Mountains from 1890 to 1894, visiting Great Britain in the interest of Canadian western missions and securing aid and interest, and has been minister of St. Stephen's Presbyterian Church in Winnipeg since 1894. His exceedingly popular tales of life in the wilderness are characterized by manly and fervid Christian feeling, and have had the widest circulation in Canada, Great Britain and the United States. They include *Black Rock*, *Beyond the Marshes*, *Given's Canyon*, *The Sky Pilot*, *Ould Michael*, *The Man from Glengarry*, *Glengarry School Days*, *The Prospector* and *The Doctor*.

Gordon, D. M., was born in Pictou, Nova Scotia, in 1845, and educated there and later at Glasgow and Berlin Universities. Ordained in 1866, he assumed charge of St. Paul's Church, Truro, Nova Scotia; removed to St. Andrews, Ottawa, in 1867;

and in 1882 went to Winnipeg and became pastor of Knox Church. In 1887 he removed to St. Andrew's, Halifax, and in 1894 was appointed professor of theology in the Presbyterian College. He succeeded the Rev. G. M. Grant as principal of Queen's University, Kingston. He still holds and fills successfully that very important and responsible position.

GEN. J. B. GORDON

Gordon, John Brown, was born in Upson County, Ga., Feb. 6, 1832. When the Civil War broke out, he joined the Confederate side and won his way up from captain to major-general, and was eight times wounded in engagements, and severely at Antietam. From 1873 to 1880 and from 1891 to 1897 he was a United States senator. From 1887 to 1890 he was governor of Georgia. He died in 1904.

Gorgas, William C., whose great work in stamping out malaria and yellow fever and establishing modern sanitary conditions is referred to in our article on the Panama Canal, was born in Mobile, Ala., Oct. 3, 1854. He is a graduate of the University of the South and of Bellevue Medical College. He entered the Medical Department of the Army in 1880 and was made Colonel in 1903 by Congress for his brilliant service in establishing sanitary conditions in Cuba. In 1908 he was elected President of the American Medical Association.

Gor'gon, a frightful female monster supposed to have lived in the lower regions, according to Homer; in the western ocean, according to Hesiod. There were three gorgons, according to Hesiod, but Medusa was the most frightful. They were represented with wings, brass claws and having serpents for their hair and girdles. A later story says that Medusa was a mortal changed by Minerva, so that whoever looked upon her was turned to stone. She was killed by Perseus, and her head placed in the shield of Minerva.

Gorill'a, the most manlike of the apes, a native of the dense forests of west-central Africa. Old males reach a height of five feet and six or eight inches. They more frequently assume the erect position than the other apes. Their bodies are covered with very dark gray hair, intermingled with a few red hairs. They live in pairs, with their offspring, rather than in troops. They have flat noses and very prominent ridges over the eyes, and their facial expression is hideous and brutal. They are very ferocious. They feed upon berries, sugarcane and other vegetables. Very few people have seen a living gorilla, as they have not been exhibited in zoological gardens. A young one was exhibited in Berlin and attracted much attention. For the structural relationship of apes with man see Ape.

GORILLA

Gor'ky, Maxim, the pen-name of Alexi Mamimovitch Pyeshkoff, a Russian author, born at Nizhni Novgorod in 1868. After being variously employed in different parts of southeastern Russia as shoemaker, gardener, ship's cook, baker, porter and lawyer's clerk, he finally travelled as a tramp over a large part of Russia. The experiences met with in these wanderings furnished the basis for most of his subsequent literary work. He has won an international reputation through his stories dealing chiefly with the tragedies in connection with the life of the lower classes. His first story of note, *Makae Schudra*, appeared in 1892.

Gor'man, Arthur Pue, United States senator from Maryland and president of the Chesapeake and Ohio Canal Company, was born in Howard County, Md., March 11, 1839, and educated in the public schools of his native county. From 1852 to 1866 he served as page in the United States senate and was appointed postmaster of the senate. He was subsequently collector of inland revenue for the fifth district of Maryland, a member of the Maryland legislature, speaker of the house and state senator. He was elected to the United States senate in 1880, taking his seat in the following year, and was re-elected in 1886 and again in 1892. After 1898 Mr. Gorman was in forced retirement until 1903, when he returned to the United States senate for the term 1903–09. But he died on June 4, 1906. During much of the period that he was in the United States senate he was the dictator of politics in Maryland and the Democratic leader of the senate.

Gortchakoff (*gôr-chä-kof'*), **Prince Alexander Michaelovitch,** a Russian statesman, was born at St. Petersburg, July 16, 1798. He was educated at the Lyceum of Tsarskoe-Selo, and became experienced in diplomacy under Nesselrode, whom he succeeded as minister of foreign affairs. In 1854–56, while minister to Austria, his efforts were instrumental in passing the Treaty of Paris. In the Polish rebellion of 1863 he decried foreign interference, and said that Russia should be allowed to settle her own internal affairs. For his decided stand in this matter he was made chancellor of the empire in July, 1863. He was known and admired throughout Europe, and was the most notable diplomat until the height of Bismarck's popularity. He was a member of the Berlin congress in 1878, and died at Baden-Baden, March 11, 1883. See Julian Klaczko's *Two Chancellors.*

Gos'nold, Bartholomew, an English navigator and an early explorer of New England. In 1602 he sailed to America in the *Concord* with the idea of founding a permanent colony. He touched the coast of Maine, discovered and named Cape Cod, Martha's Vineyard and Elizabeth Island, now Cuttyhunk, and at the last-mentioned place attempted to found the colony. The difficulties of pioneer life and the hostility of the Indians soon made all hands discouraged, and they returned to England laden with a cargo of furs, cedar and sassafras.

In 1606 Gosnold was influential in securing a charter from James I, for the purpose of establishing a colony in Virginia. The following year three ships were sent out, carrying 105 adventurers as prospective colonists. Jamestown was founded, but the settlement was unsuccessful, Gosnold with many others being carried off by disease before many months had passed away in the new colony.

Gosse, Edmund William, English poet and *littérateur*, was born at London, Sept. 21, 1849, and was at an early age assistant-librarian at the British Museum and lecturer in English literature at Trinity College, Cambridge. In 1904 be became librarian of the House of Lords. He has written, besides several volumes of dramas and verse, lives of the poets *Gray*, *Donne* and *Congreve* the dramatist; *Northern Studies; Seventeenth-Century Studies; History of Eighteenth-Century Literature; History of Modern English Literature; Gossip in a Library; The Secret of Narcisse; The Jacobean Poets; From Shakespeare to Pope;* and *Life of Jeremy Taylor.*

Gosse, Philip Henry, British zoologist, was born at Worcester, England, April 6, 1810, and died at Torquay, Devon, Aug. 23, 1888. His early life he spent in Newfoundland, after which he spent three years as a farmer in western Canada and a year in Alabama as a school-teacher. He then went to Jamaica for a short while, where he developed his tastes as a naturalist, and returned to England, where, with the exception of a further brief visit to the West Indies, he settled down to literary work, and, in 1856, was elected a fellow of the Royal Society. His publications embrace *Letters from Alabama, The Canadian Naturalist, Birds of Jamaica, A Naturalist's Sojourn in Jamaica, Text-Book of Zoology, A Naturalist's Rambles, The Aquarium, Handbook of Marine Aquarium, Marine Zoology, Evenings at the Microscope, Romance of Natural History* and *Land and Sea.*

Go'tha. See SAXE-COBURG AND GOTHA.

Gothenburg (*gŏ-'tĕn-bōōrg*), the city of Sweden next in size and importance to Stockholm, stands near the mouth of the River Gota. The town is built upon a plain beside the river, while its suburbs extend along the slopes of the surrounding hills. Gothenburg is an important center of trade and manufacture. It exports iron, steel, machinery, zinc, lumber, oats, sailcloth, fish and leather. The city was founded in 1618–9 by Gustavus Adolphus. Among social reforms the town is noted for its regulation of the saloons. Its present population is 167,813.

Goths, the name of a Teutonic people whose earliest known home was on the southern coasts and islands of the Baltic. The history of their southern wanderings is unknown, but in the 3d century they were living north of the Black Sea, their ranks greatly swollen by many conquered tribes. Those farthest east became known as Ostrogoths (East Goths), those farthest west as Visigoths (West Goths). In the reign of King Ostrogotha (248–49) war was waged against the Romans, who were routed at the battle of Abritta. For 18 years the eastern Roman provinces were ravaged by the Goths, but they were defeated by Claudius, and in 270 were given the province of Dacia by the Emperor Aurelian. So the Visigoths settled in Dacia, while the Ostrogoths remained in southern Russia. In the middle of the 4th century the Ostrogothic king, Ermanaric, carved out a powerful kingdom reaching from the Black Sea to the Gulf of Bothnia. In 375 this kingdom was overthrown by the Huns, while a few Ostrogoths with the Visigoths crossed the Danube and placed themselves under the protection of the Romans. Later on, the Visigoths were granted lands in Thrace and the Ostrogoths in Phrygia. They had their own laws and 40,000 of their warriors were organized into a highly paid, separate army. These Goths, who became part of the Roman empire, had for the most part become Christians, probably because of the 40 years' labor among them of the apostle Wulfila, himself a Goth. After the death of the able Emperor Theodosius (395), the Visigoths rose in rebellion under their young king, Alaric. Though held somewhat in check by Stilicho, on the death of that great general Rome was three times besieged. Twice the city was saved by agreeing to Alaric's terms, but the third time it was given up to plunder. The whole nation, not merely the army, had followed Alaric in his wars, and, when his death made the conquest of Italy seem impracticable, they migrated to southern Gaul and soon spread over nearly the whole of Spain. The Visigothic kingdom of Toulouse, as it was called, was founded in 418, and came to include the greater part of Spain, Provence and all of Gaul south of the Loire and west of the Rhone. The most noteworthy happening in the history of this kingdom was the great battle in 451 near Troyes, often called the battle of Chalons, in which the Visigoths, under their king, Theodoric I, joined with the Romans and Franks in crushing the Huns under Attila. This battle destroyed the Hunnish empire and kept Europe from being overrun by these savage hordes. In 507 the battle of Voclad was won by the Franks under Clovis, and the Visigoths were forced beyond the Pyrenees. The great Ostrogothic emperor, Theodoric, and his general, Theudis, for a time really ruled the Visigoths, and afterward the only king of importance was Leovigild, who made Toledo his capital, and conquered Portugal and the northeastern part of Spain. All we know of Roderic, "the last of the Goths," so famous in story, is that he was defeated in 711 on the banks of the Guadalete by the Moorish invaders. Under the pressure of the Moorish yoke all the Christians on the peninsula became united into one nation, when the Goths were no longer heard of as a people; but the Spanish nobles have always claimed to be descendants of the Goths.

The Ostrogoths, who had been overthrown by the Huns in the 4th century, adopted the wandering life of their conquerors and formed part of the vast horde which followed Attila the Hun to Gaul. When the Hunnish empire fell, they became independent and settled near Vienna. They soon became the mercenaries or hired soldiers of the eastern empire. But later, driven by famine, they migrated to the southeast, ravaging Mœsia and Thrace. In 474 the young Theodoric, who when a boy, had been sent to Constantinople as a hostage and had there been educated as a Roman noble, became king of the Ostrogoths. After 14 years of warring, he was given permission to conquer Italy from the usurper Odoacer. The whole nation, numbering probably a quarter of a million, followed him on his five years' conquest. Theodoric's long reign as ruler of Rome till his death in 526 was one of the ablest and best in Roman history. But under the eastern emperor, Justinian, the generals, Belisarius and Narses, reconquered Italy. The Goths fought their last battle at Mons Lactarius, near Vesuvius, in 552. Narses allowed the defeated army to march out of Italy, and what became of it is unknown. The Ostrogoths had ceased to be a nation.

The Gothic language belongs to the east Germanic group, which includes the Scandinavian, while the west Germanic group includes Old English and Low and High German. As the Bible translated by Bishop Wulfila is several centuries older than the earliest writing which we have of any other Teutonic language, the value of Gothic in the study of the early Teutonic languages is very great. For Gothic architecture see ARCHITECTURE. See Henry Bradley's *The Goths to the End of the Dominion in Spain* and Gibbon's *Rome*.

Göt″terdäm″merung. The concluding piece in Wagner's *Der Ring den Niebelungen.* First performed at Bayreuth, Aug. 17, 1876. *Der Ring* is a complete exposition of Wagner's artistic principles. The other parts of this tetralogy are *Das Rheingold, Die Walküre* and *Siegfried.* As in Wagner's other works, the poetical text was written by himself.

Gottingen (*gĕt′tĭng-en*), a city in the former kingdom of Hannover, Prussia, containing a few ancient buildings, one, the Jacobikirche, having a steeple 320 feet in height. It was made a town in 1210, and suffered much in the Thirty Years' War. Its famous university was founded in 1734, and now has 149 professors. 1,149 students and a library of 500,000 volumes and 6,000 MSS. Longfellow, Bancroft and many other illustrious Americans studied here. Population 35,000.

Gottschalk (*gŏt′shälk*), **Louis Moreau,** American pianist and composer, was born at New Orleans, La., May 8, 1829, and died at Tijuca, Brazil, Dec. 18, 1869. In his youth he manifested marked musical ability, and was sent to Paris to pursue his studies. His first appearance in public as a pianist was in 1845 in Paris, where he gave promise of the distinction and favor with which he was later regarded. He then returned to the United States, where he made the round of the chief cities, giving piano recitals. He also wrote many compositions for the piano, including a cantata, and a symphony entitled *Night in the Tropics.*

Gough (*gŏf*), **John Bartholomew,** lecturer, was born in Kent, England, Aug. 22, 1817, was sent to America at the age of 12, and found work on a farm. He afterward went to New York city, finding employment in the Methodist Book Concern. He lost his position through dissipation and drunkenness. In 1842 a Quaker induced him to sign the pledge, and he soon afterwards determined to spend his life in temperance work. He lectured with great pathos, humor and earnestness throughout America. The power of his oratory over his hearers was great, as was also his success in winning drunkards to a sober life. In 1853 he was engaged by the London Temperance League, and spent two years in lecturing in England, and again went to England in 1857 and 1878. He died at Frankfort, Pa., Feb. 18, 1886. See his *Sunlight and Shadow*.

Gould, Benjamin Apthorp, was born at Boston, Sept. 27, 1824, and graduated from Harvard in 1844 and from Göttingen University, Germany, in 1848. On his return to America he conducted the *Astronomical Journal* for 12 years; was director of the Dudley Observatory; and the first to determine the difference in longitude between America and Europe with mathematical exactness. In 1868 he was given charge of the National Observatory at Cordoba, in the Argentine Republic, and there mapped out a large part of the southern heavens. He returned to the United States in 1885. He published some valuable astronomical reports and charts, and died at Cambridge, Mass., Nov. 26, 1896.

Gould, Jay, American financier, was born at Roxbury, N. Y., May 27, 1836, and died at New York Dec. 2, 1892. He is an interesting example of the American self-made man, for, with little education and no advantages from family connections or other aids, he acquired a commanding place in the American financial world and died leaving an estate estimated at over seventy million dollars. Brought up on his father's farm, he had but little schooling; yet what he obtained at Hobart Academy showed him to possess a taste for mathematics and surveying. The latter he himself early put to use in conducting surveys, which enabled him to engage for a time in the lumber business and later to acquire an interest in a bank at Stroudsburg, Pa., and the bonds of a railroad. These investments turning out well, he established himself as a broker in New York city. He later acquired controlling interest in the Erie Railroad, and was for a time its president, and subsequently became a heavy operator in the stock of the Pacific and other railroads, eventually forming what became known as the Gould system, aggregating some 13,000 miles of railway plant. He also became financially interested in the New York elevated railways and in the Atlantic, Pacific and Western Union telegraph companies, which added their quota to his colossal fortune.

Gould, Helen Miller (Mrs. Shepard), is America's Lady Bountiful who has been compared with England's noble Lady Burdett-Coutts. Born in 1868, the oldest daughter of Jay Gould, she became, on the death of her mother, her father's close companion and adviser. At the age of 24 she inherited a fifth of his estate of $70,000,000, and was named one of its executors. To fit herself for these duties she took the full course in a law school. Her brothers and sister married, she retired to her country home, Lyndhurst, on the Hudson, and devoted her life and fortune to benevolence. So quietly did she go about her good work, however, that the world heard little of her until the opening of the Spanish-American War, when she gave the United States Government $100,000 for national defense; and went in person to Camp Wykoff, Cuba, to superintend the distribution of $50,000 worth of comforts to sick soldiers.

As Miss Gould, at Woody Crest, on her Hudson River estate, she built and maintains a vacation home for the children of New York's slums. She supports beds in the Babies' Shelter, gives free scholarships to poor, promising students, and obtains positions for a number of boys and girls. Her mail is so large as to require a private secretary. Many requests for help must be refused; worthy objects of benevolence she personally investigates. It was after a visit to the district around the Brooklyn Navy Yards, that she built the Y. M. C. A. clubhouse to keep "Jack Ashore" from temptation.

Under the medium height, dark-haired, dark-eyed, shy, the lady of Lyndhurst dresses simply and is unknown to society She works as hard as if she had to make her living, and says that nothing seems to her so pathetic as idleness and the lack of some worthy absorbing interest. Russell Sage said that she is a splendid railroad man.

Gounod (*goo'nō'*), **Charles François,** an eminent composer, was born at Paris, June 17, 1818, and studied music at the conservatory there, afterward going to Rome to complete his education. While at home he gave his time mostly to sacred music. The first work to bring him any notice was the *Messe Solonnelle*. His first opera, *Sappho*, was produced in 1851, and in 1859 *Faust*, the greatest and most enduring of his works, met with immense success. Some of his other works are *La Reine de Saba* (1862); *Romeo et Juliette*

CHARLES F. GOUNOD

(1867); and *Le Tribut de Zamora* (1881). He was a member of the Institute of France and a commander of the Legion of Honor. He died on Oct. 18, 1893.

Gourd. This common name is applied to the small hard forms of *Cucurbita pepo* which are ordinarily used for ornamental purposes. In England, however, it is a name applied to species of *Cucurbita* in general. In America the various forms are designated as gourds, pumpkins and squashes. The common pumpkin (*C. pepo*) is probably native to tropical America, but is not known wild. It was found cultivated by the Indians along with maize when America was discovered. The various forms of crookneck squashes (*C. moschata*) are said to have been derived from eastern Asia. The ordinary squash (*C. maxima*) is probably American. The genus contains about ten species, but innumerable varieties have been cultivated.

Gov'ernment, a term that may be broadly used to indicate any kind of system for the regulation of conduct, in most cases refers to state, county, township or city control over the conduct of citizens. According to Aristotle and the Greek tradition, there should be three kinds of government. It may be monarchic, resting in the hands of one individual. It may be aristocratic, and rest in the hands of the few. Or again, it may lie in the power of the many or be democratic. But modern governments are not so simple. England, for instance, is a monarchy; yet England is governed by the many. A more valuable classification of governments arises out of the distinction between the power and duty of making laws and the power and duty of carrying them out. The former is the office of the legislature, the latter of the executive. In presidential systems, like that of the United States, these are somewhat independent of one another. Both rest equally upon the sovereign state or nation. But in parliamentary systems, like that of Great Britain, the executive depends upon the body that legislates; and its members resign their offices the moment that the majority in parliament may have turned against them. It is doubtful which plan is the better.

Within the government of the state there is need of a complex system of local government to meet the needs of cities and of the smaller divisions of the country. Local governments, as in Russia, often grow up without reference to the central government. But except in the case of *federations*, such as the United States, Germany, Australia and Canada, the local governments have only such powers as the central government grants or permits them. The states of a federation, however, share in the supreme powers of government. In some cases, such as the United States and Australia, they retain all powers which the constitution does not specifically vest in the central government. In the Canadian type of federation, on the contrary, the powers of the states are enumerated, and all else falls within the dominion of the federal government.

State government in the United States is provided for according to Article X of the amendments to the constitution, which declares that "the powers not delegated to the United States by the Constitution, nor prohibited to it by the States, are reserved to the States respectively or to the people." The states may even decide upon their own laws and mode of government, provided only that it be republican. Within recent years almost every state has made some amendment to its own form of government. Upon the whole, in this process the state governors have gained, the state legislatures lost, power.

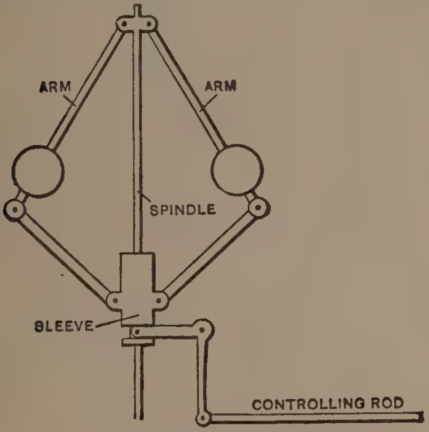
County government is created by the will of the legislature. In the United States there are nearly 7,000 counties, which are for the most part electoral districts. Each county has its court and often its asylum and its prison. Counties generally include several towns; but New York City reverses this system, and includes four counties.

Township government is most characteristic of New England, where it has grown up as a local institution from the time of the earliest settlements. In New England, then, the township practically takes the place of the county as the local unit. Indeed, in Illinois, Michigan, Minnesota, Wisconsin and other states the township system has been attempted, in imitation of New England, but with no very great success. A New England township votes money yearly for the poor, the schools, the township officers, the roads, bridges and other local needs which in most states fall wholly or in part to the care of the county.

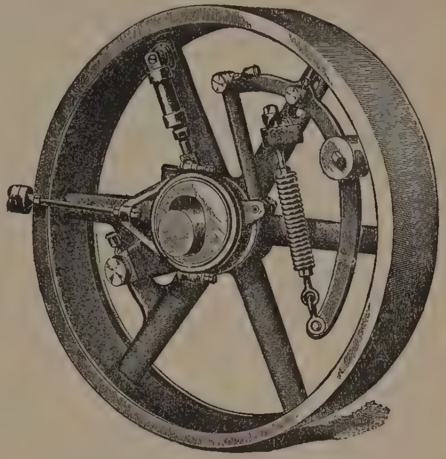
City government is, like the government of counties, dependent upon the will of the state legislature. Many cities hold their own individual charters by special enactment of the state legislature. Others govern themselves according to state enactments of a more general character, covering all cities of a given class. Sometimes the legislature provides that the charters are to be subject to the approval of a vote of the people. Because of the great wealth of the cities, there is apt to be more danger of corruption in city government than in other forms; but there is no doubt that nothing save a special municipal government is fitted to cope with the great and peculiar problems of city life.

School districts are divisions of the township, which were greatly in vogue in New England between 1800 and 1850. Indeed, the school district, in which the governing body is simply the assembly of householders or parents, is still the unit of school government in some states. Thus about half of the towns of Connecticut preserve a district system. The district government of the schools has the advantage of an extreme democracy; but the disadvantages of smallness and isolation. In Connecticut since 1866 the school districts may be consolidated by a vote of the town. It was part of the work of Horace Mann to show the deficiencies and weakness of the district system which arise from its extreme decentralization.

Gov′ernor (engine), a device attached to a steam-engine or other motor for keeping the speed of the machine constant within practical limits. As applied to a steam-engine, the object of the governor is to act on the throttle-valve or on the supply of steam to the cylinder, so that the supply of steam is proportional to the load. The common engine-governors depend on balancing the centrifugal force of a revolving mass either against gravity or against the force of a spring. The governor applied to the steam-engine by Watt consists of two heavy balls attached to two inclined arms, which are jointed to an upright spindle so that the balls can move in a vertical plane, thus forming a double conical pendulum. The spindle is geared so as to revolve with a speed proportional to that of the engine, and as the speed of the spindle increases the balls fly out and rise against gravity. For a definite speed the balls have a definite position. Beyond this speed they rise, and below this speed they fall. By suitable links and levers the supply of steam is increased or decreased for lower or higher speeds. In modern high speed engines (speeds over 150) the governor most commonly used is placed inside the fly-wheel. A heavy mass on a lever attached to a spoke of the fly-wheel is held toward the center by a spring, and as the speed increases the spring is stretched and the mass flies out. By suitable mechanism this movement regulates the supply of steam. The demand upon a governor is that, in engines for ordinary service, the speed must not vary more than 2%; and for electric light service not over 1%.



WATT'S ENGINE-GOVERNOR



A HIGH SPEED ENGINE-GOVERNOR

Gow′an, Hon. James Robert, a senator of the Dominion, was born in Ireland in 1815 and came to Canada in 1832. After serving as a volunteer in the rebellion of 1837 he was called to the bar of Upper Canada in 1838, and appointed judge in 1843, retiring from the bench in 1883. He was appointed chairman of the board of judges in 1884 and a senator the year following. He introduced the present mode of procedure in divorce cases in the senate, and has been president of its divorce tribunal since 1889, making now 56 years of judicial service. In addition he has taken an important part in the revision and codification of the laws of the Dominion.

Grac′chi (*grăk′ī*), **The,** two Roman brothers, who were celebrated as soldiers and tribunes.

Tiberius Sempronius Gracchus, the elder, was born about 168 B. C., and in 137 served as questor with Mancinus against Spain. In 133 he was elected tribune and attempted to re-enforce the agrarian or land law of Licinius Stolo, and succeeded in passing the measure. But, as with all good men, he was falsely accused of violating the sacredness of his office; and, in the midst of the next election, he was, with many of his supporters, foully murdered.

Caius Sempronius Gracchus, younger by nine years than his brother, was serving in Spain under Scipio Africanus at the time of Tiberius' murder, but felt himself urged by his brother's death to return and take up his work. In 123 he stood for the tribuneship and was a second time elected in the following year. He labored always for the poor, and one of his first acts was to re-establish the agrarian law. But jealousy and deceit were at work, and he was defeated for a third term. Soon the senate began to repeal his laws; he appeared to protest, when a riot occurred wherein over 3,000 of his friends were killed. He was compelled to fly, and escaped to the grove of the Furies with a single slave, where the slave first killed his master and then himself. It was Cornelia, the mother of the Gracchi, who, in answer to a many-jeweled Roman matron's request to see some of her jewels, said, as she presented her sons: "These are my jewels!"

Gra'ces, The (Greek *Charites*), the daughters of Zeus and Eurynome, the embodiments of gracefulness and beauty. In Roman mythology they were the three daughters of Venus, by Jupiter or Bacchus, named Aglaia, Thalia and Euphrosyne. Though represented as three sisters, they are always inseparable, and in Greece annual festivals, called *Charitesia*, were held in their honor. In art they used to be represented as draped, but afterward appeared as nude figures in the bloom of early youth.

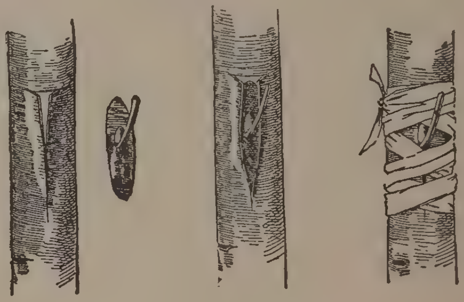
Grack'le. See BLACKBIRD.

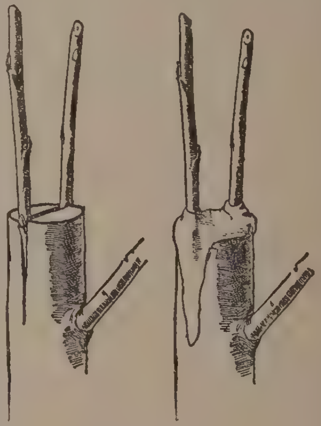
Gra'dy, Henry Woodfin, an eloquent southern orator, editor of the Atlanta (Ga.) *Constitution*, was born at Athens, Ga., in 1851, and died at Atlanta, Dec. 23, 1889. He was educated at the University of Georgia and at the University of Virginia, and devoted himself to journalism. His addresses made him widely known, as they were characterized by an impassioned patriotism which explains his popularity in the south. His two best-known addresses dealt with *The New South* and *The Future of the Negro;* the former was delivered before the New England Society. A biography of him was written by Joel Chandler Harris.

HENRY W. GRADY

Graft'ing, a process of plant-propagation in which a bud-bearing portion of a desirable variety is made to grow on another plant, so as to take advantage of the more or less well-established root-system of the latter. Graftings can be made only on plants of the same or very similar species, such as apple-quince or plum-peach combinations. The fruit of the part engrafted is like that of the tree it came from rather than like that of the stock. Different methods are budding, stem and root-grafting.

Budding is a method in which a mature bud of a desirable variety is grafted on another plant by slipping it through a cut in the bark of the stock, preferably a young seedling. Budding is used when the plant is so valuable that every available bud is used for a separate plant; stem-grafting, when a tree proves a disappointment on coming into bearing; root-grafting is the usual process used by nurserymen. In stem-grafting, also called cleft-grafting, from the method, branches about one inch thick are cut off squarely and split, into this cleft two twigs are fastened so as to be in contact with the growing tissue next the bark, and the whole stump is waxed over. Not more than one fourth of a tree should be so treated in one year, and then just before the buds open. In grapes the process is modified by cutting off the stem near the ground. In root-grafting, the stock is a yearling seedling, not much larger than the scion, as the twig is called. The seedling root may be cut into several pieces, each a few inches long. Both scion and stock are cut off diagonally and split, joined and bound firmly together. This is done in the fall, after which the graft is allowed to heal together in moist sand through the winter, and is set out in the spring. Fruit trees must be propagated in this way because their seeds do not breed "true," as do grains, but tend to revert to the wild


BUDDING


GRAFTING

type, so that one cannot predict what a seedling will produce. See PLANT-BREEDING and PROPAGATION. See Thomas: *The American Fruit Culturist* and Goff · *Principles of Plant Culture.*

Grail or **Graal, The Holy,** the subject of romance in the middle ages. It is the name given to the cup used by Christ in the Last Supper, in which, according to tradition, he changed the wine into his blood. This cup, kept by Joseph of Arimathea, was used to receive the blood which flowed from the wounded side of Christ as he hung on the cross. This account is found in the gospel of Nicodemus, which is not accepted as one of the books of the New Testament. Traces of the tradition are found in the struggles between Moors and Christians in Spain and in the founding of the order of Templars in Palestine. It is best known as one of the legends that cluster around the story of King Arthur and his knights. As the story relates, Joseph of Arimathea had been kept in prison by the Jews for fifty years after the death of Christ, but had been miraculously preserved from old age and death by the possession of the Holy Grail. He was released by Christ, who, teaching him the words used in the ceremony of the mass, commanded him to observe daily the sacrament of the Last Supper. Joseph came to Britain, and his son became the first bishop of the island. The last possessor of the Holy Grail sinned, and the cup was lost. The Quest of the Holy Grail was the search for this lost treasure undertaken by Arthur and the Knights of the Round Table. As it had been lost through the impurity of its possessor, so it could be found only by one who was perfectly pure. Launcelot, who had reached the room where it was kept, was warned to depart, but, disobediently looking in, was thrown to the ground by a blast of fire, where he lay "twenty-four days and as many nights as a dead man" Sir Galahad (according to some Sir Perceval) alone of the knights was pure enough to see the Holy Grail, which was soon after taken up to heaven. Several churches in France and Italy claimed the possession of this cup, and the Crusaders found one which was thought for a time to be the true Holy Grail and is still kept in the Cathedral of Genoa. In literature the story has had a prominent part, and is the subject of one of Tennyson's beautiful *Idylls of the King* and of Wagner's opera of *Parseval.* See *Idylls of the King* by Tennyson; *Morte d' Arthur* by Malory; and *History of the Holy Grail* by Furnival.

Grain-Eleva'tor, a building erected primarily for the purpose of storing grain, preparatory to its shipment in large quantities. A grain elevator is often situated at some port. It usually consists of large bins in which grain may be held, and a structure at the top called a cupola containing machinery for loading and unloading the grain. Machinery for cleaning the grain often occupies the lowest of three stories.

The unloading is commonly done by means of large shovels operated by machinery connecting with some sort of carrier to hoist the grain to a huge hopper high up in the building, whence it can be emptied by means of spouts into any desired place below, such as storage bin, weighing hopper, cleaning hopper or exit spout for reloading.

Throughout some parts of the country, as for instance in the wheat-growing district of the northwest, there are quite large elevators erected at railway stations for the purpose of providing farmers with good facilities for shipping their grain. In older and more thickly settled agricultural communities, with better railway facilities, smaller elevators usually suffice.

Grain elevators used to be constructed largely of wood, but the great loss resulting from the destruction by fire of elevators filled with grain has led to the practice of putting up fireproof structures wherever practicable. The most modern elevators usually have steel bins or concrete ones with steel framework, outside walls of brick or stone and a cupola of steel framing covered with iron.

Some of the largest grain elevators in America are at Chicago and at different ports on Lake Superior and others of the Great Lakes.

Gram'mar. Grammar, or the science of language, has always had an important place in the schools. Three hundred years ago and for a long time after, grammar, especially Latin grammar, held the first place in the schools. But with the growth of the common-school system grammar dropped into the background. Even in the grades of the common-school grammar holds a less important place than formerly. More thoughtful teachers omit grammar almost entirely in the first six grades, leaving it to the last year or two of the grammar-school.

The chief reasons why the study of English grammar has lost its former importance may be stated as follows: 1. English grammar is admittedly unsystematic and irregular, with few inflections and an abundance of peculiar idioms and exceptions to rules. It does not serve, therefore, the supposed purpose of discipline, such as was formerly believed to be the special merit of Latin and Greek grammar. 2. It has been discovered that the study of grammar does not produce such important effects in leading to correct usage in common speech as was formerly supposed. It has been observed that children go on using incorrect English in spite of their study of grammar. 3. English grammar and the methods of teaching it were based upon the old methods and ideas applied to Latin and Greek. But these studies have now been almost wholly dropped out of the elementary schools. 4. The science of grammar is formal and abstract, and by many is supposed to be difficult for children. at least until they reach the seventh or eighth grades. Some, however, would claim that this is the special reason why it should be taught, because it introduces pupils to a more abstract form of thinking than other studies.

The general tendency of modern education is to make all studies more concrete and realistic; and, in agreement with this notion, geography, nature-study, stories and literature, history and manual training have gained a more important place in schools, while grammar has lost.

The real value of grammar may be stated thus: All human thought is expressed chiefly through language and, at bottom, the rules of correct thinking are involved in the study of grammar. Correct language is the popular form of logical thinking. To analyze sentences, to examine the structure and arrangement of the parts, to study the various modes of expressing thought and shades of thought grammatically — these activities have always been regarded as the most fundamental and universal method of disciplining the intellectual faculties. In this respect grammar contributes an element of logical accuracy to all studies and lays a basis for correct thinking. The study of grammar (in spite of the criticism mentioned above) also teaches correct usage. Students of more mature years are greatly helped in correcting their faults by insight into the rules of grammar. They learn to criticise themselves and the wrong usages to which they have been accustomed.

The method of teaching grammar has been a subject of much controversy among educators. The older grammars were essentially deductive, proceeding from rules and principles to examples and further applications. Some of the later grammars have emphasized the inductive approach to the rules of grammar. In the inductive method the analysis of sentences is put first. Out of this study of sentences develop later the rules of syntax and the classifications of forms of speech and usages. Some of the more recent grammars have taught the subject as a thought-study, an analysis of the processes of thinking rather than a formal treatment of words and sentences.

Students in the high-school, employed in the study of German or French (or it may be Latin or Greek), are believed to receive a grammatical training superior to that given by the study of English. A chief argument for the study of Latin is first its linguistic disciplinary training and second its reflex influence upon English grammar and speech. Latin has had a great historical influence in determining the development of English speech. It has supplied many words and phrases and has shaped English speech through great writers who were fully saturated with the Latin language and Latin style. See Chubb's *The Teaching of English;* Hinsdale's *The Teaching of the Language Arts;* Whitney's *Grammar;* and Carpenter's *The Teaching of English* (Baker and Scott). C. A. McMurry.

Gram'ophone. This apparatus is a modification of the graphophone, and like the graphophone is based upon Edison's phonograph. In the gramophone the cylindrical record is discarded, being replaced by a disc or, rather, two discs. One of these discs is of rubber and generates the sound; the other, upon which the record is written and of which the rubber disc is an exact copy, is of glass, with a lamp-black surface upon which the stylus may write the records. The invention of the disc is due to Emile Berliner (1887). A feature of the gramophone is that the record groove does not only vibrate, but serves to propel the reproducing stylus.

Gram'pians, a mountain system of the Scottish highlands. Some apply it to the chain on the border of the Lowland plain between Dumbarton and Stonehaven, and others include the range from Stonehaven to Ben Nevis. It also is a range in West Victoria, Australia.

Granada (*grȧ-nä'dȧ*), formerly a Moorish kingdom of Spain, but now divided, having an area only of 4,937 square miles and a population under 500,000. It has been under Spanish rule since 1492.

Granada, capital of the province and, formerly, of the kingdom of Granada, lies at the foot of the Sierra Nevada, on the right bank of the Jenil. It is beautifully situated, about 2,000 feet above the sea. The city has become dull and sleepy, its market and squares, university and jasper and marble-decorated cathedral being its chief objects of interest. The industry and trade amount to almost nothing. The university was founded in 1531 and has several hundred students. It is known, however, to have been one of the most splendid cities of the Old World in the days of its prosperity. It was founded by the Moors in the 8th century, and rapidly became important for art and industry, having a population in 1492 of 400,000. It was surrounded by a strong wall with 1,030 towers. The Moorish palace of the Alhambra (*q.v.*), still beautiful in its ruins, the unfinished palace of Charles V and many other buildings tell of its former grandeur. It was captured by Ferdinand and Isabella in 1492, but still prospered under Spanish authority until the final expulsion of the Moors in 1609, which reduced its population to its present small numbers. Population 75,054. See Prescott's *Ferdinand and Isabella* and Washington Irving's *Conquest of Granada*.

Grandfather's Chair, two series of stories for children, written by Nathaniel Hawthorne and published in 1841 and 1842. They are chiefly about persons and events well-known in connection with early life in America.

Grand Forks, North Dakota, a city which almost doubled its population between 1890 and 1900 and has now 12,478 people, lies at the junction of the Red Lake River and the Red River of the North. The city was founded in 1871; and in 1884 became the seat of the state university. It may be reached by the Great Northern and Northern Pacific railroads. Grand Forks is the center of a district rich in timber and in grain. The water-supply and electric light plants at Grand Forks are the property of the township.

Grand Rapids, the second city of Michigan, is situated upon both sides of the rapids of the Grand River. A dam has been constructed across the river at this point, and the water-power derived from it is considerable, although at present it furnishes but a small percentage of the power used in the city. The chief industry is the manufacture of furniture, and Grand Rapids has become the leading furniture-city in the United States. Twice a year — in January and in July — wholesale buyers from every state come to Grand Rapids to place their orders. The population is 112,571.

Grand River, in southern Ontario, empties into Lake Erie at Port Maitland, and is navigable for a considerable distance. Flora, Paris, Brantford, Cayuga and Dunnville are on its banks. In early days, when the whole country was wooded, small vessels made use of it in carrying merchandise and farm and timber products. It waters a fertile and quickly settled country.

Grand Trunk Pacific Railway Company. This company, incorporated in 1903, agreed with the government of Canada to construct and operate a railway across Canada wholly within Canadian territory, the estimated mileage of the main line being 3,600 miles. Important branch lines are also building. One will extend southerly 199 miles from the main line to Fort William and Port Arthur on Lake Superior, to reach navigation on the Great Lakes. Another will run southerly from the main line 229 miles to North Bay or Gravenhurst in Ontario, to connect with the lines of the Grand Trunk Railway. Including branch lines, the total mileage will be 5,000 miles.

The prairie section is built through the great wheatbelt of the northwest, an area believed to be four times as large as the wheatgrowing area of the United States. The Pacific terminus (Prince Rupert) will be so much farther north than any existing port, that the distance between Europe and Asia will be shortened by at least two days. This, the newest transcontinental road, will have steamship lines on both the Atlantic and Pacific oceans. Its importance in developing the resources of Canada cannot be overestimated. Considerable work on both sections has been done.

Gran'ite. Granite is a crystalline, igneous rock composed chiefly of quartz and feldspar, with which are associated mica or hornblende or both. Other minerals are sometimes associated in small quantities. The lava which became granite was not poured out on the surface, but cooled and crystallized far below the surface under great pressure. If it now appears at the surface, as it does in many places, it is because the rock which originally overlay it has been removed by erosion. Only those lavas which have such composition as to give rise to the above minerals produce granite, and these only when the lava solidifies under the proper conditions. Granite contains 62 to 75 per cent. of silica. Granite belongs to no particular age, but has originated in all ages and may be forming now, far beneath the earth's surface. Granites usually are grayish or reddish in color. The red color is due to the feldspar, which sometimes has this color. If this mineral be white, its combination with the black or dark colors of the mica and hornblende produces a grayish effect. Granite is extensively used for buildings and monuments, its value depending on its durability, color and susceptibility to polish. Its hardness and the consequent difficulty and expense with which it is worked prevent its use for the commoner sorts of stone-work. In the United States granite is extensively worked in New England, but it also occurs and is worked to some extent in many states. (See *Mineral Resources of the United States*, published in the Annual Reports of the United States Geological Survey; also, *Stones for Building and Decoration* by G. P. Merrill.)

Grant, George Monro, D.D., Canadian educator and clergyman and principal of Queen's University, Kingston, Ontario, was born near Pictou, Nova Scotia, Dec. 22, 1835, and educated at Pictou Academy and at Glasgow (Scotland) University, where he carried off the Lord Rector's prize and high honors. In 1860 he was ordained a minister of the Church of Scotland and had appointments at Georgetown, Prince

GEORGE M. GRANT

Edward Island, and at Halifax, Nova Scotia. In 1872 he accompanied the Canadian engineer, Sir Sandford Fleming, on his overland journey to British Columbia, the result of which was embodied in an entertaining book, entitled *Ocean to Ocean.* In 1877 he became principal of Queen's College, Kingston, Ontario, for the endowment of which he has raised over $400,000, and by his learning and unique personality raised it to a high status among Canadian universities. He served as president of the Royal Society of Canada and as moderator of the general assembly of the Presbyterian church of Canada, and held the degree of LL. D. from Dalhousie and Toronto Universities. His other writings include *Advantages of Imperial Federation, Our National Objects and Aims, The Religions of the World,* etc. A man of powerful personality, marvelous versatility and indomitable perseverance, coupled with deep religious convictions, Principal Grant's death, which occurred in 1902, was a distinct loss, not only to the institution of which he was the head but to the Canadian people at large.

ULYSSES S. GRANT

Grant, Ulysses S* When news that Fort Sumter had been fired on was flashed over the wires, in April, 1861, meetings were held in every city and village in the north, and volunteers by thousands offered their services in defense of the Union before President Lincoln issued his first call for troops. At a meeting in Galena, Illinois, a middle-aged clerk in the hardware and leather store of Jesse Grant came forward. Many did not know, until then, that U. S. Grant was a graduate of West Point, that he had served with distinction in the Mexican War and that he had resigned from the regular army with the rank of captain. His friends urged him to go to Washington and be restored to his old rank, for trained officers were in demand, and his rise would be rapid. It was characteristic of him that he did not think of his own advantage, but organized a company of volunteers and went with it to the state capital. Politics and self-seeking were foreign to his nature. Sheer ability and devotion to duty carried him to the top.

Born on April 27, 1822, on a farm near Point Pleasant, Ohio, the boy was named Hiram Ulysses. An error in his papers when he entered West Point Military Academy in 1839 dropped the Hiram and substituted Simpson, his mother's maiden name. He reported the error, but it was never corrected. Upon his graduation in 1843 he was sent to Jefferson Barracks, Missouri, and thence to the Mexican War where he won two brevets for gallantry. In 1848 he married Julia B. Dent, the sister of a classmate, in St. Louis, and saw several years' service in California in gold-fever days. In 1854 he resigned and retired to a farm near St. Louis, at the same time opening a real-estate office in the city. Like so many other great men Grant was a failure in business. He got into debt, and was glad to take a place as clerk in his father's store in Galena.

In May, 1861, Grant was appointed Colonel of the Twenty-first Illinois Infantry, and in August he was made brigadier-general of volunteers and given command of southwestern Missouri, with headquarters at Cairo. From the start Grant's policy was strategic and aggressive, qualities which marked his whole career. He at once took possession of Paducah, a move which secured Kentucky to the Union. On Nov. 1 he routed the Confederate garrison at Belmont Mo., a result which checked the advance of a Confederate force under General Price. In Feb., 1862, he captured Fort Henry on the Tennessee and Fort Donelson on the Cumberland, the latter after a three days' siege which resulted in the unconditional surrender of the garrison with 14,000 prisoners. This important victory broke the Confederate lines, and secured Federal control of western Kentucky and Tennessee. Grant was now made major-general of volunteers and given command of western Tennessee. On April 6th he fought the battle of Shiloh (which see), one of the severest engagements of the war. During the summer he fought the minor battles of Iuka and Corinth. He then determined to capture Vicksburg and thus open the Mississippi. The high ground east of the city offered the only favorable point of attack, but failing, after months of effort, to secure a foothold there, Grant transferred his army to the west side of the river and marched through the swamps to a point below the city, while Commodore Porter's fleet of gunboats, with the transports, ran past the Confederate batteries. Again crossing the river 30 miles below Vicksburg, he pushed rapidly between the armies of Johnston and Pemberton, defeating them separately and driving the latter into the defenses of Vicksburg. This stronghold, after a siege of six weeks, was surrendered July 4, 1863, with its garrison of 32,000 men. Grant's next campaign was for the relief of Chattanooga, where the Federal army, beaten at Chickamauga, was besieged and practically cut off from supplies. On Nov. 23rd to 25th the battles of Lookout Mountain and Mission Ridge were fought, resulting in the defeat of the Confederates. In March, 1864, Grant was made lieutenant-general and placed in command of all the Union armies. He now planned a wide campaign which should press the Confederates simultaneously at all points east and west. Leaving Sherman to fight Johnston from Chattanooga to Atlanta, he himself with the Army of the Potomac confronted the Confederates under General Lee. The clash of these great leaders came in the terrible battles of the Wilderness, Spottsylvania, North Anna and Cold Harbor and, finally, in the siege of Petersburg, which ended in its fall, the capture of Richmond and the surrender of Lee at Appomattox, April 9, 1865.

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*As a matter of curious interest U. S Grant Jr. informs the Editor of The Student's that the S was always written without a period and that while it may have meant "Simpson" it was never so written.

The war was over. Grant, hailed as the nation's deliverer, went immediately to Washington to hasten the disbanding of the army. He was created General, a higher rank than had hitherto existed in our army. His magnanimity toward his late foe won the gratitude of the south. He threatened to resign, if President Johnson had Lee tried for treason. In 1868 General Grant was elected President.

"The man on horseback" is not always a successful executive. But General Grant made up for his lack of experience in public office by his personality. In the president's chair he displayed the same characteristics that he had in the field. Self-reliance, prompt decision, willingness to assume full responsibility, moral and physical courage, devotion to duty, simplicity, purity of personal life and unimpeachable honesty marked him. Honest himself, he reposed complete confidence in those around him, and was sometimes betrayed. The eight years of his presidency covered the difficult period of reconstruction in the south, the adoption of the 15th Amendment, the financial crisis of '73, the completion of the Union Pacific Railway and the Franco-Prussian War. Mistakes were made — errors of judgment deplored to-day, but, in the midst of the turmoil, Grant secured the passage of the first Civil Service reform bill and a treaty with Great Britain defining the rights and duties of neutral nations in time of war.

In 1877 General Grant made his famous tour of the world, in which Occident and Orient were in rivalry to do him honor. At the age of 56 a man of enduring fame, he was too poor to maintain his family in its enforced prominent position. Investing his capital in the banking firm of Grant and Ward, with his usual trust in his associates and his ignorance of business, he left the conduct of the enterprise to his partners. The firm failed, Grant was robbed and left penniless. A fall had crippled him, so that, at this time and until his death, he had to use a crutch.

Nothing in all the career of this great American is so heroic as the closing year of his life. Bankrupt, crippled, dying of cancer of the tongue, he dictated two volumes of memoirs to provide for his family. When it was absolute agony to speak, with a fortitude and unselfishness that have few parallels in history, he continued his task, completing it only four days before his death at Mt. McGregor, near Saratoga, N. Y., July 23, 1885.

Of the literary quality of these *Memoirs* it is enough to say that Edward Everett Hale asserts that "no prose writer of our country is more likely to be generally read three centuries hence than the despatches of Grant;" and Matthew Arnold, a severe critic, declared that the style of Grant's *Memoirs* equals that of Cæsar's *Commentaries*. See *Personal Memoirs*.

Gran'ville, George Leveson-Gower, Earl of, English statesman of the Liberal school, was born at London, May 11, 1815, and died there on March 31, 1891. After an education at Eton and at Christ Church, Oxford, he acted under his father as attaché at the English embassy in Paris, and in 1836 entered the house of commons, becoming under-secretary of state for foreign affairs. In 1846, on the death of his father, he entered the house of lords, and in 1851 succeeded Palmerston as secretary of foreign affairs, and became president (from 1852 to 1854) of the council. In 1868, under Gladstone, he was secretary of state for the colonies, and during 1870–74 was once more secretary for foreign affairs. The latter office he also held under the same premier during the years 1880–85.

Grape, species of *Vitis*, a genus which contains about 40 species belonging to temperate and subtropical regions. About 25 species are found wild in the United States. The group is said to be the oldest of domesticated fruits, and the original wine-producing form is *V. vinifera*, which probably was native to Asia. Although the production of wine is the principal use of the grape, the production of raisins is an important industry. The American species which has been most developed is *V. labrusca* of the Atlantic region, which is the parent of the well-known Concord and Catawba forms. The Delaware and Isabella grapes are said to have varied so far from the original types that they cannot be recognized. While in the eastern and southern United States the native grapes were being domesticated, in California the Old World *V. vinifera* was introduced, and therefore the Pacific grape culture is that of the Old World. Outside of California, the most important regions of grape-culture are in New York and Ohio along the lakes and rivers. There also are important grape-plantations in

Ontario, Michigan and the cooler parts of Georgia and Alabama.

Grape-Fruit, a species of *Citrus*, to which oranges and lemons belong. The species is *C. decumana*, and it is popularly known by the names pomelo and shaddock as well as grape-fruit. It is native to the Malayan and Polynesian islands, and seems to be most extensively cultivated in India, Florida and California, although of general occurrence in tropical and subtropical countries. The ordinary globular forms of the market are pomelos or grape-fruits, while the pear-shaped shaddocks are seldom found in the markets.

Grape Phyl'loxe'ra, a small insect with sucking beak, that is very destructive to vineyards. It belongs to the plant-lice. Its injuries have been most extensive in France, and many memoirs have been written about it. There are two forms, one attacking the roots, the other the leaves. They produce swelling on the root and galls on the leaves. It has been combatted with only partial success.

Grape-Sugar. See GLUCOSE.

Graph'ite. Graphite is a relatively incombustible form of carbon. It occurs chiefly in association with highly metamorphic rocks, and is supposed to be of vegetable origin. Highly metamorphic coal sometimes becomes graphitic; that is, coal may be so metamorphosed as to be partially changed into graphite. Some of the coal of Rhode Island is graphitic. The principal use of graphite is for the manufacture of crucibles and pencils. In the manufacture of crucibles it is mixed with clay, and its value for this purpose depends on its infusibility. Only the finer grades of graphite are used in the manufacture of pencils, and for the manufacture of the best grades of pencils the graphite must be carefully freed from all impurities. Graphite is used in limited quantities for many other purposes, as stove polish, lubricants for machinery, etc. In 1906 the total product from the United States was 19,097 tons. The commercial product was derived from Alabama, Michigan, New York, Pennsylvania and Rhode Island. The largest and purest supply of the United States comes from Ticonderoga, N. Y. Canada also produces graphite. The value of graphite depends largely upon its purity, the highest grades being of great value.

Graph'ophone. An instrument invented by Charles S. Tainter and Chickester A. Bell for reproducing sounds, particularly human speech and music. It is much the same in principle and construction as the phonograph invented by Edison, but has minor mechanical advantages, for example, a wax-coated cylinder instead of one made entirely of wax.

Graph'otype. This is a process which makes it possible for the artist actually to draw his own engravings, instead of having them merely copied for printing. The original method dates from 1860, when De Witt C. Hitchcock used an ink made of lampblack and glue upon a surface of compressed French chalk resting on a zinc plate. When the uninked chalk has been removed, the remainder may be hardened in a silicate, and the picture is then electrotyped.

FLOWER

Grass. The usual name of members of the family *Gramineæ*, which is one of the largest and certainly one of the most useful groups of plants as well as one of the most peculiar. Grasses are world-wide in their distribution, and are remarkable in the display of individuals, commonly growing so densely over large areas as to form a close turf. Associating with them the sedges, which resemble them in habit, there are about 6,000 species. Here belong the various cereals, as wheat, barley, rye, oats, rice etc.; also sugar-canes, sorghum, bamboos and pasture-grasses. The flowers are small, having no floral leaves and consisting chiefly of three stamens surrounding a single pistil, whose ovary ripens into the grain or characteristic seed-like fruit of the group. One of the most noteworthy features of the group is the prominent development of peculiar bracts in connection with the flowers. Each flower is completely protected or even inclosed by one or more of these bracts; and, as they usually overlap one another, the flowers are invisible until the bracts spread apart to permit the long dangling stamens to appear. These bracts are the so-called chaff of wheat and other cereals, and by botanists are called glumes, those glumes most closely associated with the flowers being the palets. In the temperate regions grasses for the most part are lowly plants, while in the subtropical and tropical regions they rise until such forms as the canes and bamboos form growths that may be called forests. The ordinary grasses of the United States may be roughly grouped as turf-forming grasses and bunch-grasses. The former spread by creeping rootstocks, and soon form a compact mat or turf. Such grasses are naturally the most suitable for lawns and pastures. The bunch-grasses are more characteristic of poor soils or of dry regions, and occur abundantly on our western plains, growing, as the name suggests, in clumps or stools.

Grass'hopper, a very common jumping insect belonging to the group (*Orthoptera*) containing crickets, cockroaches, katydids and others. These insects are world-wide in their distribution, and those with short antennæ are properly called locusts. The locusts of the Bible and the great clouds of locusts mentioned in history were grasshoppers. In the United States the name locust is improperly given to the seventeen-year cicada. Grasshoppers have four wings, the outer ones hard and the flying wings underneath them folded like plaits of a fan. They have biting jaws, and eat, sometimes insects, but more commonly vegetables. The males make sounds by rubbing the spiny surface of the thighs against the wing-covers; the cracking sound given out by some grasshoppers while flying is due to rubbing the upper surface of the flying wings against the lower surface of the wing-covers. Their eggs are laid in groups in the ground, in fence-posts, logs, stumps etc. The destruction of crops by the small Rocky Mountain locust is historical. These insects appeared in great numbers, and not only destroyed the corn and other crops, but stripped the leaves from the trees. From 1874 to 1876 this insect damaged western agriculture to the extent of more than $200,000,000, working especial harm in Kansas, Nebraska, Colorado, Missouri and Iowa. The United States government appointed an entomological commission in 1877 to study the problem, and these pests were combated by burning over the breeding-grounds, destroying the young in ditches by burning straw and by other means. Of other forms that do much damage, mention may be made of the American locust, which devastates our southern states; and of the differential locust, very injurious to cotton-plantations in Mississippi.

See *Reports of the Entomological Commission* for 1878–79 and 1880–82; Sanderson: *Insects Injurious to Staple Crops;* Mary Treat: *Injurious Insects of Farm and Garden;* Howard: *The Insect Book.*

Grat'tan, Henry, a great Irish patriot and orator, was born at Dublin, July 3, 1746. At seventeen he entered Trinity College, and at twenty-one Middle Temple, London, to study law. In 1772 he was called to the Irish bar, and soon after was elected to parliament, where he took the place of Henry Flood, who had lost his popularity by taking office under the government. The country was in a poor condition on account of loss of trade with America, and the restriction of Irish trade, and he at once set about the effort to reform. He then cherished the idea of a separate parliament, and on April 19, 1780, after fifteen hours' argument and perhaps the best speech of his life, an indefinite adjournment was taken. A month later the Rockingham ministry apparently acquiesced, but his friend Fox asked for more, and the point for which Grattan so long strove was lost. In 1790 he was returned to parliament for the city of Dublin, and took up the cause of Catholic emancipation, labored heart and soul in the effort, but was overcome by circumstances that ended in the revolution of the United Irishmen in 1798. He retired to private life, broken in health, until in 1806 he appeared in the English house of commons as a member for Dublin, only again to work for his former cause. On May 20, 1820, he crossed from Dublin to make his last appeal, but arrived dying, and expired at London, June 4, 1820. Grattan's figure was small and spare, his face long, thin and slightly marked with smallpox. His gestures in speaking were violent and odd, and his voice of no great power, but he wielded his hearers at will by his energy, passion and overpowering earnestness and enthusiasm. See Lecky's *Leaders of Public Opinion in Ireland.*

Gratz (*gräts*), the capital of Styria in Austria, is built on both sides of the River Mur. Its fortress was demolished by the French in 1809. It has many old buildings — the fine Gothic cathedral (built in 1462), a Gothic church (dating from 1283), the university (founded in 1586) and four monasteries of the 16th and 17th centuries. The university has a teaching staff of 147 with 1,971 attending students. In 1481 it repulsed the Hungarians and in 1532 the Turks, but was taken by the French in 1797 and 1809. It has important manufactories of machines, steel goods, rails, railroad-cars, sugar, wine, candles and soap. Population 138,080.

Grav'el. The term gravel is applied to aggregations of small, water-worn stones of any kind. There are no definite limits to the size of the constituents. Fine gravel grades into coarse sand, and coarse gravel grades into shingle or aggregation of cobble-stones. Gravel occurs frequently along swift streams and the shores of lakes and oceans. When cemented into rock, gravel becomes conglomerate.

Gravelotte (*gräv'lŏt'*), a village in Lorraine, near Metz, where, on Aug. 18, 1870, the French under Bazaine were defeated by the Germans. The French loss was about 15,000, that of the Germans 20,000.

Gravita'tion, that property of matter in virtue of which every particle in the universe attracts every other particle. The name (from the Latin *gravis*, heavy) is due to the fact that the most familiar illustration of gravitation is the attraction which the earth exerts upon all bodies at its surface. The force with which the earth attracts any body is called the *weight* of that body. About 1665 Newton suspected that it is the attraction of the earth upon the moon (or the weight of the moon) that retains the moon in her orbit. He proceeded to compute the period of revolution of the moon on this hypothesis, and found, after getting correct data, that this period is very exactly that of the lunar month.

Later he showed that the attraction of the sun on the planets, according to the same laws, would account for all the planetary motions. Recent observations apparently show that the ordinary laws of gravitation hold even in the case of double stars, bodies entirely outside the solar system. The principal facts known concerning gravitation are the following: 1. The force of attraction between any two particles varies directly as the product of the masses of those particles. 2. The force of attraction between particles varies inversely as the square of the distance separating these particles. 3. The force of attraction is independent of the kind of matter composing the particles and independent of the medium between the particles.

These laws may all be summarized in the following equation. Let m and m^1 represent the masses, r the distance separating them and F the force of attraction. Then

$$F = G\frac{m^1}{r^2}$$

where G is a constant known as the gravitation constant. The exceedingly accurate measures of C. V. Boys give for this constant the value, 6.6576×10^{-8}. The equation for F, just given, is known as Newton's *Law of Universal Gravitation.* No satisfactory explanation of gravitation has ever been suggested. Newton pointed out very clearly that his law describes the facts, but does not explain them. Among the most important inferences which may be drawn from Newton's law are: (1) Kepler's three laws; (2) the fact that a homogenous sphere acts as if its entire mass were concentrated at its center; and (3) the attraction of a homogenous sphere on a particle lying anywhere between its center and its surface varies directly as the distance of the particle from the center.

Gray, Asa, American botanist, was born at Paris, N. Y., Nov. 18, 1810; became a physician in 1831; but soon abandoned medicine for the study of botany. He was appointed botanist of the United States exploring expedition to the southern seas in 1834, but resigned before setting out in 1837. In 1842 he became professor of natural history at Harvard, and remained until 1873. In 1874 he became regent of Smithsonian Institute, succeeding Agassiz. Besides many textbooks, now in use in all schools, he wrote *Examination of Darwin's Treatise; Darwinia*; and *Natural Science and Religion.* He died Jan. 30, 1888. He ranks among the leading botanists of the age. He was very successful as a teacher and through his books in imparting the first principles of botany to beginners. He also was the first in America to arrange the species of plants in accordance with the natural system of arrangement which has taken the place of the older system of Linnæus.

Gray, Horace, American jurist and associate-justice of the supreme court of the United States, was born at Boston, Mass., in 1828, and graduated from Harvard. After studying at Harvard Law School he was admitted in 1851 to the Massachusetts bar, and for seven years (1854–61) he acted as reporter to the supreme court of the state. From 1873 to 1882 he was chief-justice of the supreme court of Massachusetts, and in the latter year was elevated to the supreme court of the United States, as one of the associate-justices. He died on Sept. 15, 1902.

Gray, Thomas, one of the foremost English poets, was born at London, Dec. 26, 1716. His father's violent temper had forced his mother to leave him, and Thomas was brought up by his mother and her sister, of both of whom he was passionately fond. At school, at Eton, he met his best friend, Horace Walpole, who at once took a fancy to the shy and studious boy. At Peterhouse, Cambridge, he greatly disliked mathematics, which then was the chief study there, and after some four years of university work he was easily persuaded to spend two years and a half in travel with Walpole. On reaching home he began to write poetry. The next spring (1742) he went back to Cambridge, took his degree in civil law, and as a resident-student spent there the most of his life, though he afterward left Peterhouse for Pembroke Hall, because of a practical joke played on him by some of the students. He took the keenest pleasure in the company of his friends. His holidays were spent with his mother at Stoke Pogis or with Walpole at London. His *Ode on Eton College* was printed in 1747. The death of his aunt seems to have brought his mind back to a projected work which was soon to bring him fame — his *Elegy in a Country Churchyard.* This poem he had begun on his return from the trip with Walpole, and had then thrown aside. The poem was sent to Walpole, was handed about in manuscript, and soon became so well-known that Gray was forced to print it in 1751. This stately poem is perhaps the best-known piece of English verse. Wolfe said he would rather have written it than capture Quebec. Three years later appeared his *Pindaric Odes* and *Progress of Poesy.* Perhaps his greatest work followed after another three years had gone by — *The Bard.* His studies of Icelandic and Celtic verse bore fruit in *The Fatal Sisters* and *The Descent of Odin.* In 1768 he was made professor of history and modern languages at Cambridge. Dr. Johnson said of Gray that he "was a man likely to love much where he loved at all." He was, however, greatly subject to fits of the blues; yet no poet was ever happier in his friendships or better beloved. It has been said of him that "he had little to say and took his time to say it." He certainly did not write much, but on the strength of what little he cared to write he has taken high rank among his fellow-poets. He died on July 30, 1771. See his *Life* by Edmund W. Gosse, in the English Men of Letters Series; and the essay, by Matthew Arnold, in Ward's *English Poets*.

Great Basin, a triangular plateau, covering the western part of Utah, nearly the whole of Nevada and part of California and Oregon, and extending into Idaho, lying between the Wahsatch and the Sierra Nevada Mountains. It stretches about 500 miles along the base of the triangle from east to west and 800 miles from north to south. It is traversed by mountain ranges and covered by many streams and lakes, mostly salt, that have no outlet, but either drain by evaporation or sink into the sands of the desert.

Great Bear Lake, in Mackenzie District, part of the Northwest Territories of Canada, is the most northerly of the large bodies of fresh water. It is 246 feet above the level of the sea, very irregular in shape, with an area of about 14,000 square miles. A river of the same name flows from it into the Mackenzie. It is crossed by the Arctic circle, and therefore is frozen half the year.

Immediately above it, in the Polar sky, is the constellation of the Great Bear—hence its name. About it is the largest tract of unexplored land on the continent. This is the country of roving Eskimos. It is the source of the Coppermine and Great Fish Rivers. This lake is said to teem with herring.

Great Brit'ain, the name commonly applied to the United Kingdom of Great Britain and Ireland, lies west of continental Europe, and is bounded on the north by the Atlantic; on the east by the North Sea; by the English Channel on the south; and on the west by the Atlantic, the Irish Sea and St. George's Channel, thus forming the largest island area of Europe. It was called Great Britain to distinguish it from the smaller Brittany in France; but the name was used only in a poetical sense until James I styled himself King of Great Britain in 1604. The greatest length of the kingdom is 608 miles, and the greatest width about 325, while the total area is 121,391 square miles.

Geology. The geological formation of Great Britain has formed an interesting study to scientists for many years. Every period of the formation of matter and solids is found in different parts of the island, varied formations and varieties of rocks and minerals being distributed from end to end and from shore to shore. In nothing has Great Britain more wealth than in its coal and iron; indeed, these have formed the mainstay of its power. The coal-system extends from the Bristol Channel to the base of the Cheviots, and from it over 264,000,000 tons of coal are taken annually. The iron is more an industry of the last hundred or more years; in fact, it has only developed since the use of coal in the place of charcoal for smelting. The iron ore is chiefly found in connection with the coal-beds; but much of it, in the form of red and brown hematite, is mined in the rock and limestone formations. The iron ore produced in the United Kingdom in 1910 amounted to a gross weight of 15,226,015 tons, valued at about 19½ million dollars. In 1911 the aggregate value of the total imports of the U. K. and also of the exports (British, foreign and colonial) exceeded 5,989 million dollars. Besides these, copper, tin and zinc are largely mined. The surface formation is rugged and uneven. The northern part of the island is covered by scattered, irregular mountainous groups, that form no regular chain or system, but look much as if a bunch of round-shouldered, flat-topped humps had been placed here and there at random. None of these elevations exceeds 4,000 feet in height. Traveling southward, the nature of the country becomes more level, and this tendency prevails until the hills and mountain systems of Wales are reached.

Climate. The climate, as that of no other country in a like latitude, derives its peculiarity from its situation and from the prevailing winds, which are from the southwest, except in the months of April and May. The thermometer for six months in the year ranges near 60° and seldom, if ever, drops below 36° during the remaining six months, thus affording, according to all authorities, one of the healthiest climates in the world.

Commerce and Manufactures. British shipping has always been a factor in the world's commerce. In 1910 there were 38,928 vessels sailing under the British flag, or 67 per cent. of the entire shipping of the world. The volume of the steam tonnage in the year named was 10,442,719, and of sailing tonnage, 1,112,944 tons. With its natural mineral resources, the amount of its shipping and the number and productiveness of its farms, Britain is one of the richest countries of the globe. This is exclusive of its manufactures of cotton, woolen, silk and linen goods and leather, which amount to about one billion dollars a year. The total population of the United Kingdom *i.e.*, England, Scotland, Wales, Ireland, Isle of Man and the Channel

Islands, in 1901 was about 42,000,000; in 1911 it was 45,365,599. In 1910 there were 23,387 miles of railway in operation, besides 4,673 miles of canals and 53,765 miles of telegraph lines under the postal system.

The British Empire includes, besides the United Kingdom, the colonies directly or indirectly under its government. These colonies cover more than ninety times its own area (121,391 square miles); and include one-sixth of the land surface of the globe, with a total population of 400 millions. The total area of the British Empire is 11,447,954 square miles, with a gross population of 419,401,371 souls. Among the larger and more important colonies are British India, the Straits Settlements, Ceylon, Mauritius, Hong-Kong, five colonies in Australia, Tasmania, New Zealand, Fiji, Natal, Cape Colony, Transvaal, Orange River Colony, Bechuanaland, Rhodesia, Cyprus, Ascension, Barbados, British Honduras, Grenada, Zanzibar, Gold Coast, Sierra Leone, Canada, Newfoundland, Bermuda, Bahamas, Jamaica, the Windward and Leeward Islands, British Guiana, Gibraltar, Aden, St. Helena and Malta.

Great East'ern. This immense vessel, once the largest ever built, was planned in 1852 for the Eastern Steam Navigation company; a vessel being wanted to sail to Australia round the Cape of Good Hope, which could carry coal enough for the voyage — out and home — and have space besides for passengers and cargo. The idea was to accommodate 1,000 passengers, 5,000 tons of cargo and 15,000 tons of coal. Her eight engines were estimated to work up to 11,000 horse-power. She carried six masts, five of them of iron. The vast, wall-sided compartments of the ship, it was designed, could be changed into cabins for 800 saloon passengers, 2,000 second-class; 1,200 third-class; and 400 officers and crew; or 5,000 could be carried, if all emigrants or troops. The plans for this mighty vessel were never fully carried out in all their details, owing to numerous refittings and alterations. The directors decided on a trial trip across the Atlantic. It was a disaster. The *Great Eastern* left the Thames on Sept. 8, 1859. An explosion of steampipes took place off Hastings, seven persons were killed and several wounded, and the voyage came to an end at Portland. She started again, June 17, 1860, from Southampton, and crossed to New York in eleven days. She made many trips, losing money, as the expenses and repairs came to more than the receipts. She "paid out" the Atlantic cable, and successfully laid some others of the most important ones across the Atlantic, in the Mediterranean, Red Sea, etc. She was used as a coal-hulk at Gibraltar in 1884. At last, after being utilized as a "show," she was sold by auction in Liverpool to be broken up.

Great Ex'pecta''tions, one of the works of Dickens which appears to have been suggested in part by scenes from his own childhood, was published in 1861. The hero, a boy called Pip, allows himself to form great visions of a noble and wealthy estate to which he is to be called, on no better basis than a mysterious allowance which is paid to him, he knows not whence. Great is the conflict within his soul when his benefactor is found to be an escaped convict, whom Pip had accidentally befriended; and who in the end is recaptured, only to die in prison.

Great Falls, Mont., the capital of Cascade County, on the Missouri River, in western-central Montana, 75 miles northeast of Helena. The Great Northern Railroad runs through it, as does the Great Falls line which connects it with the Canadian town of Lethbridge in Alberta. In the region are rich mines of copper, lead, iron, coal and building-stone, together with silver and gold. The town's motive power is derived from an immense dam at Black Eagle Falls. Its chief manufactures are flour, furniture, mining and agricultural implements, carriages and woolen goods. It possesses most of the adjuncts of an enterprising modern city. Population 13,948.

Great Kanawha (*kȧ-na'wȧ*) **River,** a tributary of the Ohio, rises in the Blue Ridge of North Carolina, and is called New River for part of its course. It is navigable for about 100 miles from its mouth, and is 450 miles in length.

Great Pedee' River is formed in North Carolina by the union of the Rocky and Yadkin Rivers. It flows southeast into South Carolina and empties into Winyah Bay. Its main branch is the Little Pedee. It is navigable for 150 miles from its mouth to the falls at Cheraw.

Great Powers of Europe, The. This term properly dates from the Congress of Vienna, which met September, 1814, was interrupted by Napoleon's return and his last campaign, and was finally dissolved on June 9, 1815, before that campaign ended in the battle of Waterloo. The Great Powers were Austria, France, Great Britain, Prussia and Russia. Prior to this, the combinations of the Powers were in the form of coalitions against the great force of France, but thenceforward France entered the circle on equal terms with the rest. The Congress of Vienna reëstablished the monarchies of Prussia and Austria which Napoleon had overthrown, and otherwise settled the affairs of European nations. The monarchs of these Great Powers then formed the Holy Alliance, England alone abstaining, which for many years was successful in preventing the growth of republican institutions in Europe, and was in large measure the unwilling cause of the liberation of South American countries from Spain and Portugal. It crushed popular movements in Spain, Italy and Greece. But in 1827 all the Powers joined in giving Greece its freedom from Turkey and in making it an independent kingdom by the treaty of London. The same Powers in 1831 recognized the independence of Belgium from Holland. Against the wishes of France the remaining four Powers saved Turkey from the invading forces of Mehemet Ali, viceroy of Egypt (1841). The Powers were once more divided by the desire of Russia to partition among the Powers the Turkish domain in Europe. There resulted the Crimean War (1854), in which France and England, together with Sardinia, went to the rescue of Turkey. The Powers met again at the Peace of Paris (1856), when the Black Sea was closed to vessels of war and the integrity of the Turkish empire guaranteed. Again, the Powers were divided when France assisted Italy in its successful effort to gain freedom from Austria. Italy became an independent kingdom in 1866. The Austro-Prussian, the Franco-German and the Russo-Turkish war were followed by the Congress at Berlin, June 13–July 13, 1878, when the map of Europe was arranged very much as it is now, the partition of the Balkan States and their freedom from Turkey being then brought about. This was the last important meeting of the Great Powers of Europe. The attempt to come to agreement with regard to the affairs of Egypt (1885) was unsuccessful. With the opening of the first Hague conference (1899) the idea of controlling the policy of Europe by six Powers (for Italy had now to be considered) gave way to the idea of a world-wide unity of action, in which not only the United States but Japan and China should take part.

Great Salt Lake, in Utah, is over 80 miles long and from 20 to 32 wide, and is the outlet of the Bear, Ogden, Jordan and Weber Rivers. It lies at the base of the Wahsatch Mountains, 4,200 feet above the sea-level, and is very shallow. It has no outlet, except by evaporation of its waters, and contains a large quantity of salt — about 15 per cent. — in which no fishes thrive. Great Salt Lake or, as it has been called, Lake Bonneville was first mentioned by a Franciscan friar, Escalanta, in 1776, but was not explored until 1843, by Frémont. There are well-marked shore lines on the mountains around, reaching 1,000 feet higher than the present level, which show that the lake was once vastly larger. See H. H. Bancroft's *Utah*.

Great Slave Lake, in the southern part of the District of Mackenzie, Canada, is an immense inland sea (area 11,821 square miles). It is navigable throughout its whole length and breadth. At its western end the Mackenzie River which flows into the Arctic Ocean (one of the eight largest rivers in the world) has its starting point. The southern shore of the lake has good agricultural prospects.

Great Slave River, in the province of Alberta (Canada), is 300 miles long, flows into Great Slave Lake, and is noted for its abundance of fish.

Great Sodus. A settlement in Wayne County, New York, on the southern shore of Lake Ontario, where a large quantity of American military stores was seized by Canadian and British forces on June 19, 1813.

Grebe (*grēb*), a kind of waterbird, is peculiar for its semi-webbed feet and legs set very far back in such a way as to be better adapted for swimming than for walking on shore. There are more than 20 species, one or another of which is to be found in any quarter of the high seas. The downy feathers of grebes are in demand for ladies' muffs and other articles of winter dress. In America grebes are often popularly called hell-divers. The horned grebe, to be recognised by a ruff of rusty-black feathers upon the head, is common both to America and Europe. The European variety, known as the great crested grebe, grows to a length of over two feet.

Greece is the most easterly of the three southern peninsulas of Europe, extending into the Mediterranean. Its states or provinces are divided from each other by its mountain ranges and peaks, which have associated with them many very interesting and entertaining stories. The range on the north, which separates Greece from the continent of Europe, is a continuation of the Balkans. From this several chains extend in a somewhat southerly direction, dividing Macedonia from Illyria and Epirus from Thessaly. The eastern boundary is marked by the sea and mountains from the Balkan system, among them being Olympus, 9,750 feet high (upon which were supposed to dwell the gods of ancient mythology), Ossa, Mavro, Vuni and Pelion. That part of the range which marks the eastern boundary of Thessaly extends beyond the mainland and forms the islands of Eubœa, Andros, Tinos, Mykonos, Naxia and Amurgos. The "island" of Pelops, called the Peloponnesus but bearing the modern name of the Morea, is connected with the mainland by the narrow isthmus of Corinth. The islands have mountain systems of their own, among the higher peaks being Aroania (7,724 feet) and Taygetus (7,904 feet).

Transportation. The rivers, from the size and nature of the country, are of little importance, and flow generally south or west. The largest are the Aous, Achelous, Peneus and Haliacmon. In October, 1903, the canal (four miles in length) across the Isthmus of Corinth was opened for traffic

In 1904 there were 700 miles of railway in operation, besides 4,000 miles of telegraph lines.

Products. Its chief products are currants, wine, oil and olives, besides minerals and agricultural products. Sponge-fishing also is an important industry.

Government and Cities. The law-making power is vested in a house of representatives, called the *Boulé*, consisting of 207 members, elected by universal suffrage but convened and adjourned by the king. The total area of Greece and dependencies is about 25,014 square miles, with a total population of a little more than 2,600,000 The chief towns are Athens, the capital (population 167,479); Piræus (73,579); Patras (37,724); Corfu (18,978); and Zante (13,580).

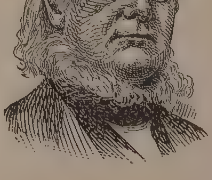
People. The ancient Greeks were a branch of the family that includes most Europeans, coming from what were styled Indo-European or Aryan peoples. They were not a grand division of the human race, except as regards language. It is doubtful whether the home of the original people was in Europe or in Asia, but there is hardly any question that the first Greek tribes were wanderers, living on their flocks, who entered Greece over the mountains of the north; and, as each succeeding tribe followed, the preceding ones were pushed further southward, until not only was the mainland occupied, but Greek settlements filled Sicily and the Mediterranean islands and dotted Asia Minor. These Greeks called themselves *Hellenes*, were called *Græci* and *Ionians* by the Italians and Orientals in turn, while Homer speaks of them as *Danaans* and *Achæans.* It has been said that there are no Greeks in Greece, but it is pretty certain that the modern inhabitants are descendants of the three races — Greeks, Thracians and Illyrians — that lived at the time of the Roman conquest. The language of the Greeks was closely allied to Sanskrit, and was spoken in seven dialects, at least to the end of the second century, but later modifications and changes were made which left the language in its present form.

Religion. When we first have any account of the ancient Greek religion, we learn that they followed a kind of idolatrous worship of many gods, each supposed to control a different branch of human destiny and endowed with varying attributes and powers. The worship was by prayers, offerings and sacrifices. This was mythology. The modern Greek church is called the Orthodox church, and is endowed and supported by the state and subject to it in all but spiritual matters.

History. The earliest history of Greece which can be mentioned with any certainty begins with the Dorian invasion, which, covering about two centuries, was completed about 1000 B. C. This invasion caused the people then in Epirus to move to Thessaly, the Thessalians to emigrate to Bœotia, while the Doric invaders formed the state of Sparta. The effect of this invasion was to cause the former inhabitants to be reduced to slavery not only in the mainland but in the colonies, and tyranny was rife. Sparta, on account of the small number of its people, became a military state, more as a matter of self-protection at first, but afterward grew into a predatory state. In 431 B. C. the great war between Sparta and Athens began, and it lasted for 27 years before Athens was defeated. The supremacy of Sparta being thus established, it set about a series of oppressions and tyrannies, so that a combination of the other states, aided by the Persian king, caused its downfall and defeat at Leuctra in 370. Greece attained its greatest power under the great Alexander, the son of Philip of Macedon, who defeated Darius, founded Alexandria, overthrew the Persian empire and gained Asia Minor, everywhere planting Greek colonies. He died at Babylon in 323 B. C. Upon his death ensued the Lamian War for political liberty, but the Macedonians, under Antipater, were again victorious. In 395 A. D. Greece was ravaged by the Goths, and in 747 a great pestilence depopulated many parts of the country. In 1018 the Bulgarians swept the country, but were finally defeated by Basil II. Mohammed II made himself master of Greece in 1453, and almost all the possessions of Greece gradually passed into the hands of the Turks before 1669. Thus it remained until, in 1821, the war for independence broke out and lasted until, by the aid of England, France and Russia, Greece once more regained her liberty in 1830. In 1833 Otho of Bavaria was made king, but had to leave the country in 1862, when George I, son of the king of Denmark, was in 1863 elected king of the Hellenes. He was born in 1845. See W. M. Leake's *Travels in Northern Greece:* Schrader's *Prehistoric Antiquities* (translated by F. B. Jevon); *History*, by Thirlwall, Grote, Curtius and Findlay; and Jevon's *Greek Literature.*

Greek Literature. See LITERATURE.

Gree'ley (*grē'lĭ*), **Horace,** was born at Amherst, N. H., Feb. 3, 1811. After obtaining a common-school education, he entered a printing-office at East Poultney, Vt., and there rose to the position of assistant-editor on the *Northern Spectator.* He then worked as a journeyman-printer, reaching New York in 1831 with ten dollars in his pocket; and there, with a fellow-workman, he


HORACE GREELEY

GREEK ART

founded the *New Yorker*, a weekly, in 1834. His first success was the *Log-Cabin*, a campaign paper which aided largely to bring about the election of Gen. W. H. Harrison to the presidency in 1840. On April 10, 1841, he issued the first number of the New York *Tribune*, an advocate of temperance, co-operation, a protective tariff and the abolition of slavery and capital punishment. It at first was Whig, then antislavery Whig and subsequently the most powerful organ of the Republican party. This paper he edited until his death. In 1848 he was elected to congress. When the southern states seceded, he at first upheld their course as being in accordance with the Declaration of Independence; but when the war began, he became its earnest supporter. At the close of the war he was a strenuous advocate of amnesty for all, and went to Richmond to offer bail for Jefferson Davis, for which action he was strongly condemned. In 1872 he was a candidate for president against General Grant, and met with defeat. This broke his health and spirit, and he died on Nov. 29, 1872. Greeley was a good and popular speaker and one of America's greatest editors. He also was a well-known writer. The best known of his books are *The American Conflict* and *What I Know of Farming*. See his *Life* by Parton.

GENERAL GREELY

Gree'ly, Adolphus Washington, explorer, was born at Newburyport, Mass., March 27, 1844. He served through the Civil War, and shortly afterward entered the regular army as lieutenant. In 1868 Greely was assigned to the signal service, remaining until 1881, when he was selected to lead the expedition to the head of Smith Sound. After terrible sufferings in the Arctic regions for three years, he and the survivors of his party were rescued in 1883. He was appointed chief of the signal service, and gazetted brigadier-general in 1887. See his *Three Years of Arctic Service* and W. S. Schley's *The Rescue of Greely*.

Green Bay, Wis., the county-seat of Brown County, situated on Fox River at the entrance to Green Bay, is 112 miles north of Milwaukee. It is the oldest town in the state, having been first visited in 1634 by Jean Nicollet and thereafter settled by the French. Fort Howard, established in 1816, was annexed in 1895. Green Bay is an important railroad center, and is connected by interurban line with Oshkosh and Fond du Lac. An excellent harbor provides access for the largest vessels upon the Great Lakes, while a line of pleasure boats runs to Mackinac and the "Soo." Population 25,236.

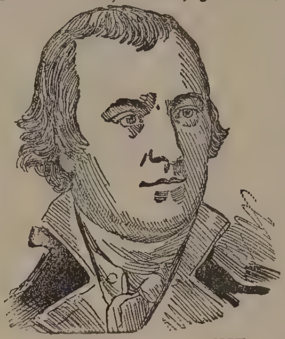
JOHN R. GREEN

Green, John Richard, English historian, was born at Oxford, in December, 1837, and was educated there. His first work was a series of papers on *Oxford in the Last Century* in the Oxford *Chronicle*. He then entered the ministry, became a curate and then vicar, all the time contributing to the London *Saturday Review*. When he became librarian at Lambeth Palace in 1868, he was stricken with consumption, yet he did not stop writing, although his condition prevented any active labor. In 1874 his *Short History of the English People* became popular at once, and reached a sale of 150,000 copies. Creighton, himself a great historian, declared that Green had done for all English history what Macaulay had done only for a period: he had unified it. Later he brought out a larger edition of the work, the well-known *History of the English People*. He worked steadily on, struggling with hopeless disease, bringing out his *Making of England* the year before he died, and leaving his *Conquest of England* to be edited by his widow. He died at Mentone, March 7, 1883.

Green, Seth, born at Rochester, N. Y., March 19, 1817, received a common-school education, but early gave all his time to hunting and fishing. When in Canada, in 1838, he noticed the odd movements of some salmon and judged that they were about to make ready a nest for their spawn. So he climbed a tree and carefully watched them for 48 hours. He saw that as soon as the spawn was cast, the male salmon and other fish ate all they could find, and that only a few eggs were left, which the female carefully hid under a covering of gravel. He had never read on the subject, but from what he saw he felt sure that fish could be artificially hatched. He invented the method of protecting the spawn of the salmon, and in 1867 hatched 15,000,000 shad at Holyoke, Mass., besides extending his work of artificial hatching to the Hudson, Potomac and Susquehanna. Green transported the first shad ever taken to California. Altogether, he artificially hatched over 20 varieties of fish, invented many appliances therefor, and wrote *Trout-Culture* and *Fish-Hatching and Fish Catch-*

ing. To him, more than to any other American pisciculturist, is due the great advance in late years in fish culture in the New World. He died at Rochester, N. Y., Aug. 20, 1888.

Greene, Nathaniel, an American general, was born at Warwick, R. I., June 6, 1742. He was raised a Quaker. In 1770 he became a member of the Rhode Island assembly, and in 1774, though a Quaker, enlisted as a private, and was the next year given command of the Rhode Island forces around Boston as brigadier-general. The next year he was made major-general, and distinguished himself at Trenton and at Princeton. He was in command of a division at Brandywine, where he saved the American army from destruction. In 1778 he was made quartermaster-general, retaining the right to fight on the field. In 1780 he defeated Clinton at Rahway, was president of the board that condemned André, resigned as quartermaster and succeeded Arnold at West Point. When Greene succeeded Gates in command of the army of the south in 1780, he found the army in so wretched a state, without discipline, arms or clothing, that he could not bring it into a condition for fighting until 1781. Then he entered South Carolina and Georgia, carrying everything before him. For this he was awarded a medal by Congress and large grants of land by South Carolina and Georgia. He died of sunstroke at Mulberry Grove, Ga., June 19, 1786. Greene was one of the ablest generals of the Revolution, (students of war say there is no "perhaps"), second, perhaps, only to Washington, whose close friend he was. See the *Life* by his grandson, Prof. G.W. Greene.


NATHANIEL GREENE

Greenland. An immense island in the Arctic, 900 miles wide by 1600 miles long. No traces are left of two settlements made in Greenland in 986. They were probably destroyed by the Eskimos some time after 1340 and in 1448 all communication with Europe ceased. John Davis re-discovered Greenland in 1585 and the Danish settled it in 1721.

Greenland trade is a Danish state monopoly. American ships fish halibut off the west coast. Area of Danish colony 46,750 sq. miles. Total area 500,000 sq. miles. Population 11,893, mainly Eskimo, European inhabitants about 250, many of whom have Eskimo wives.

The people live mainly on seals and whales, killing about 100,000 annually. Fish sharks are also eaten. The dogs used to draw sledges, are of much importance. Over 25,000 reindeer were shot yearly between 1845 and 1849, but are now scarce.

The country is mountainous, barren and covered with a glacier sheet averaging 1,000 ft. in thickness and rising into ice caps 10,000 ft. high. Under pressure of its own weight enormous glaciers flow out from this ice cap, sometimes at the rate of 50 ft. in a day through the fjords which deeply indent the coast where they break off into the icebergs that peril navigation. (See TITANIC DISASTER). The larger ice fjords each receive in a year enough ice to make a mountain more than 1000 ft. high and covering four sq. miles. Peary in 1892 and 1895 crossed Northern Greenland and rounded its Northern extremity in 1900.

So far as known Greenland is the coldest inhabited country in the world. It is the only known home of the iceburg in the northern hemisphere. It is estimated that if all the ice in Greenland were spread over the United States it would make a covering a quarter of a mile thick.

Greenland exports eiderdown, game and fish. (See Rink's DANISH GREENLAND).

Green'let. See VIREO.

Green Mountains, covering a part of Vermont, are a part of the Appalachian Range, extending in a southwesterly direction. They run in nearly parallel lines, with almost flat tops, and nowhere reach the snow-line. Among the main peaks are Mansfield, 4,279 feet; Camel's Hump, 4,188 feet; and Killington, 3,924 feet.

Green'ock, a seaport of Renfrewshire, Scotland, on the south shore of the Firth of Clyde. It is beautifully situated, lying for more than four miles along the coast, backed by abruptly rising cliffs looking out over its excellent harbor. Its beautiful public buildings, among them the city-hall with a tower 245 feet in height, attract attention. The main industry is shipbuilding, while sugar-refining comes next in order. The city has the reputation of being always wet, the rainfall being 60 inches a year. It is the birthplace of Watt, and contains the grave of Burns' "Highland Mary." Population 70,000.

Greenough (*grēn'ō*), **Horatio,** an American sculptor, was born at Boston, Sept. 6, 1805, studied for awhile at Harvard, but from 1825 lived at Rome. His principal work is the large statue of Washington, now in front of the national capitol. His other important works are *Medora*, *Venus Victrix* and a group of four, called *The Rescue.* He died suddenly at Somerville, Mass., Dec. 18, 1852.

Greens'boro, N. C., the capital of Guilford County, northwestern North Carolina, 80 miles northwest of Raleigh, on the Cape

Fear and Yadkin Valley and the Southern railroad. Considerable tobacco, corn, wheat, oats and fruit are raised in the vicinity, and there are some copper, iron and even gold found in the region. It also has blast furnaces for the manufacture of Bessemer steel, and has a number of brick, tile, terracotta and casting manufactories, cotton mills and several agricultural machine shops. It is the seat of the State Normal and Industrial College, Guilford College, Bennett College for colored youth and Greensboro College for girls. Population 15,895.

Green'ville, S. C., the capital of Greenville County, northwestern South Carolina, on the Reedy River and near the region of the Blue Ridge Mountains, which give it a desirable and pleasant location. It is the seat of Furman University, Greenville Female College and a theological school, all under Baptist direction, besides a military institute, a business college and Chicora Female College (Presbyterian). It has considerable manufactures, including cotton-mills, wagon and carriage factories, flour-mills, iron-works, etc. Population 15,741.

Greenville, Texas, county-seat of Hunt County, 51 miles northeast of Dallas. It is the tradecenter for an agricultural and stockraising region. Its industries comprise flour and cotton-seed oil mills, cotton compresses, stock-yards and machine-shops. It has good schools, and is the seat of Burleson College (Baptist). The city owns and operates the electric light plant, and has the service of three railroads. Population 8,850.

Green'way, Thomas, was born in Cornwall, England, in 1838. Settled when young in Huron County, Ontario; and was elected to the House of Commons, Ottawa, in 1875. Going to Manitoba in 1878, he was elected to the legislature in 1879, became Premier in 1888, and again was elected to the House of Commons in 1904.

Green'wich (*grĕn'ĭj*), a city of Kent, England, and a suburb of London, is situated on the south side of the Thames, about five miles from London Bridge. It is chiefly notable for its public buildings, first among them being Greenwich Hospital, for the maintenance of British sailors. It consists of four parts, built successively by King Charles, King William, Queen Mary and Queen Anne. Its first pensioners were received in 1705, and in 1814 they numbered 2,710. Among other institutions Greenwich has a naval museum, the Royal Hospital School, established in 1712, and the Royal observatory built by Charles II in 1675. Greenwich is the place from which geographers reckon longitude. It has a population of 185,149. See *The Palace and the Hospital* by A. G. L'Estrange.

Greenwich Observatory, situated in a 190-acre park in Greenwich, England, was built in 1675 for the advancement of navigation and nautical astronomy. From this observatory the exact time is telegraphed every day at one o'clock to over six hundred towns in England. It is one of the foremost observatories of the world as well as one of the oldest.

Greg'ory, the name of 16 popes.

Greg'ory I, Gregory the Great, was born at Rome about 540 A. D. He was at an early age made prætor of Rome by Emperor Justin II of Constantinople, but resigned this office and withdrew to one of the seven monasteries he had founded. "He lavished on the poor all his costly robes, his silk, his gold, his jewels, his furniture, and, not even assuming to himself the abbacy of his convent, but beginning with the lowest monastic duties, he devoted himself altogether to God." It was while here that he one day saw some fair-haired Anglo-Saxon youths in the slave-market. When he was told they were Angles, he said: "Not Angles, but angels," and was seized with a longing to Christianize their country. He set out, but was asked to return by Pope Benedict on account of the clamor over his departure. Pelagius II, Benedict's successor, sent Gregory to Constantinople as papal nuncio. He remained there for three years, writing his *Moralia*, and on his return to Rome was unanimously elected to succeed Pelagius, who had died of the plague. He was consecrated pope on Sept. 3, 590, and began an immediate reform in the organization and ritual of the Roman church, which is indebted to him for her complete ritual and chants. He also brought Britain and Spain within the pale of Christianity. He died on March 12, 604. See the Rev. J. Barmby's *Fathers for English Readers*.

Gregory VII, whose family name was Hildebrand, was born about 1020 at Soana in Tuscany, Italy. His youth was passed in the monastery of St. Maria at Rome, but his studies were finished in France at the monastery at Cluny. He became the chaplain of Gregory VI, and afterwards, in 1049, was made cardinal by Leo IX, exercising great influence and power under him and his successors. After the death of Alexander II he was unanimously elected and crowned pope, July 10, 1073. From the day of consecration he devoted himself to the abolition of the system of investiture, and declared that he would punish offenders. At one time he removed several bishops for this offense, but Henry IV sought to protect them, and issued an order declaring Gregory removed from office. Gregory responded by excommunicating Henry, who, forced by public clamor, was compelled to undergo a humiliating penance before the ban was removed. Thereupon, in 1080, Henry again declared Gregory deposed, and appointed Guibert, archbishop of Ravenna, pope as Clement III and took possession of Rome in 1084. Henry was then driven from Rome by Robert Guiscard, the duke of Apulia, but the city was left in so wretched a condition that Gregory finally had to withdraw to Salerno, where he died, May 25, 1085. His dying words were: "I have loved justice and hated iniquity; therefore I die in exile." See Milman's *Latin Christianity.*

Grenfell (*grĕn'fĕl*), **George,** African missionary and explorer, was born at Mount Bay, near Penzance, England, on Aug. 21, 1849. After study at the Bristol Baptist College he was sent to Kamerun by the Baptist Missionary Society in 1874 and to the Congo in 1876. He discovered Edra Falls in the Kamerun in 1876, the meeting of the Mobangi and Congo Rivers in 1884, and from 1884 to 1886 made a track-survey of 2,000 miles along previously unknown waterways of the upper Congo system, for which he received the gold medal of the Royal Geographical society. He was royal commissioner for the delimitation of the Lunda frontier between the Congo Free State and Portuguese West Africa and secretary of the commission for the protection of the natives of the Congo Free State. He died in 1906.

Grenfell, Wilfrid T. The first doctor to go to the fisherman. He has lived 12 years among them on the German Ocean and the Labrador coast. His name is inseparably connected with the Labrador Deep-Sea Mission. He first came to Labrador in 1892 in the mission-ship *Albert.* Through his instrumentality two well-equipped hospitals, one at Battle Harbor and one at Indian Harbor, have been erected. In them thousands of patients have been treated. Two yachts have been presented to him for mission-work. His heroism in braving the perils of that stormy coast in pursuit of his philanthropic work has won for him universal respect and admiration.

Gres'ham, Walter Quinton, American politician, was born near Lanesville, Ind., March 17, 1832, and died at Washington, D. C., May 28, 1895. Educated at Bloomington University, he was admitted to the bar, and in 1860 became member of the Indiana legislature. On the outbreak of the Civil War he retired from the legislature, and served gallantly with Sherman, was wounded at Atlanta, and retired with the brevet rank of major-general in the volunteers. From 1869 to 1882 he was United States judge for the district of Indiana, when he became postmaster-general under President Arthur, exchanging this post, on the death of Secretary Folger (Sept. 1884), for the secretaryship of the treasury. This, in the same year, he resigned to accept the office of United States judge for the 7th circuit, exchanging this post in 1893 to enter President Cleveland's cabinet as secretary of state.

Gret'na Green, a village in Dumfriesshire, Scotland, near the head of Solway Firth, made famous by the number of runaway marriages that used to be celebrated there. This was a great resort for that purpose as early as 1771, sometimes as many as 200 couples a year being married at the toll-house. In 1856 all marriages celebrated there were rendered invalid, unless one of the parties had resided for at least three weeks in Scotland.

Greuze (*grēz*), **Jean Baptiste,** a French painter, was born at Tournus, Aug. 21, 1725. He received instruction in art from Gromdon in Lyons, afterwards going to Paris to study at the Academy. *A Father explaining the Bible to His Children* created much comment, and his *Blind Man Cheated* admitted him to the Academy as an associate. Greuze now proceeded to Italy, exhibiting several Italian subjects on his return to Paris in 1757, but having failed to comply with the rules of the Academy he was barred from exhibiting there. In 1769 his *Severus reproaching Caracalla* caused his partial reinstatement, but he refused to accept it, and died in poverty at Paris, March 21, 1805. He is seen at his best in such fancy studies of girls as *The Broken Picture, Innocence* and *Girl With Doves.*

Gre'vy (*grā-vē'*), **François Paul Jules,** was born in Mont-sous-Vaudrey, France, Aug. 15, 1807. He studied law and was admitted to the bar in Paris, where he became prominent through his defense of republican political prisoners. After the revolution of 1848 he was returned to the assembly from his native department, and became prominent as a speaker. His debates on the constitution and his opposition to the government of Louis Napoleon marked his career, until he retired when the second empire was established. In 1869 he again became a deputy, and was elected president of the assembly in 1871, 1876, 1877 and 1879. In 1879, upon the resignation of McMahon, Grévy was elected president of the republic, but his term was not marked by any particular achievement. Reelected in 1885, he resigned on Dec. 2, 1887, living a retired life until his death, Sept. 9, 1891.

Grey, Albert Henry George, Fourth Earl, Viscount Howick of the County of Northumberland (England), was born 1851 and educated at Harrow and Trinity Col-

EARL GREY

lege, Cambridge. He was a member of the House of Commons from 1880 to 1885, was administrator of Rhodesia in 1896-7, and a Director of the British South Africa Company since 1898. The first Earl Grey was a general in the American Revolutionary war and the second was the celebrated Charles Earl Grey one of the distinguished statesmen of the early part of the last century. The present earl succeeded to the earldom in 1894, and in 1877 married Alice, daughter of Robert S. Holford, M. P. He has one son and two daughters. He was appointed Governor-General of Canada in September, 1904. The Duke of Connaught succeeded him in 1911.

Grey, Lady Jane, English queen for nine days, was born at Broadgate, England, in October, 1537. She was the oldest daughter of Henry Grey, afterward Duke of Suffolk, and Lady Frances Brandon, and was highly educated and accomplished. When but 16, she was married against her will to Lord Guildford Dudley, fourth son of the Duke of Northumberland, to secure the succession of the throne to Northumberland's family after the death of Edward VI, who was then very sick. On July 9, 1553, she was made queen, only three days after the death of Edward, but on the 19th she was taken a prisoner to the Tower, charged with treason, and four months later was sentenced to die. Her father's part in Wyatt's rebellion hastened her death, and she was beheaded on Tower Hill, London, on Feb. 12, 1554. In her speech from the scaffold, she "washed her hands" of any desire to be queen, and said: "I die a true Christian woman." See the *Chronicle of Queen Jane*.

Grey'hound. See Dog.

Grimm, Jacob Ludwig Karl, a great German scholar, was born at Hanau, Jan. 4, 1785. He studied law and science under Savigny at Paris. His first book was *Old German Minstrelsy*, soon followed by the famous collection of folk-lore and stories by the two brothers (Jacob and Wilhelm), called *Children and House Tales*, followed by a second volume in 1814 and the third in 1822. The brothers spent 13 years gathering these stories, mostly from the mouths of peasant-women. Jacob died Sept. 20, 1863, and Wilhelm on Dec. 16, 1859. Jacob's *German Grammar* is perhaps the greatest work on language-study of the era. His *History of the German Language*, *German Sagas* etc. show the greatest learning and deepest research.

Griqualand (*grē'kwȧ-lănd*), **East,** now part of Cape Colony, is separated from the southeast coast of Africa by Pondoland, and has Kokstad for its seat of administration. Its area is 7,594 square miles, and its population 222,459, of whom 5,868 are white.

Grisi (*grē'sē*), **Giulia,** a celebrated singer, was born in 1811 at Milan, Italy. In 1828 she first appeared at Bologna in Rossini's *Zelmira*, and in 1832 her appearance in Paris in *Semiramis* created great admiration. But London was the scene of her greatest triumphs. Bellini's *I Puritani* and other operas were written for her, but *Norma* was her greatest rôle. In 1836 she married the Marquis de Melcy and, after his death, the tenor Mario in 1856. She also sang in America, where the purity, sweetness and volume of her voice, together with her great beauty, gained her hosts of admirers. Heine wrote of her as "the singing flower of beauty." She died at Berlin, Nov. 28, 1869.

Gris'tle is the common name for cartilage. It is a firm, elastic substance. It enters largely into the make-up of the animal skeleton. It forms a rudimentary skeleton in the higher mollusks and in certain fishes, hence called cartilaginous fishes. In man and the higher animals it forms a sort of nest for the growth of bone. Temporary gristles supply the place of bone in early life and are slowly changed into bone. For some time after birth the ends of the long bones are mainly gristle. Of permanent gristles, some cover the ends of bones which make joints, as those of the cranium, the knee-joint and the ribs, and are called articular cartilages. Others, because they are elastic, keep open passages, as the gristles of the outer ear, nose and edge of the eyelids, and are called membraniform cartilages. Gristle is white or bluish-white, and its basis is a variety of gelatine. It is elastic, not easily broken and will retake its proper shape when bent.

Grosbeaks, interesting members of the finch family. The well-known Cardinal Bird is the Cardinal Grosbeak (See Cardinal Bird). The rose-breasted grosbeak is a medium-sized bird; black above and white below, its breast marked with a patch of beautiful rose-color, spots of white on lower part of wings and tail; it has a noticeable blunt, yellow beak. The rose-flush on the breast and the rich, melodious voice distinguish it; the song, bringing to mind that of robin, oriole and wood-thrush, is heard both day and night. The male assists in the brooding. The nest for the speckled, green eggs is built in low tree or

ROSE-BREASTED GROSBEAK

bush, and is very loosely constructed. The bird belongs to the eastern United States, arrives in May, departs in September. The blue grosbeak is a little larger than the English sparrow, in color dark blue and black, has a heavy bill, is a more familiar bird in the southwest. It feeds largely upon rice. It, too, is a fine songster. The pine-grosbeak is a light red above wings with markings of black and white and gray, below a lighter red melting into pale olive; it has the heavy grosbeak bill. The pine-grosbeak belongs to the north and the evergreen forests, and only in the severest winter strays over the Canadian border. It feeds upon the seeds of pine and cedar and upon berries and buds.

Grote, George, historian of Greece, was born in Kent, England, Nov. 17, 1794. In 1810 he became a clerk in a bank founded by his grandfather, and there remained for 32 years in different capacities, rising finally to be the head of the bank, though devoting all his leisure to literary study. His first contribution was a paper in the *Edinburgh Review*, in reply to Sir James Mackintosh, on parliamentary reform. He became an intimate friend of James Mill, and followed him in his philosophy. A liberal in politics, he entered parliament in 1832 and was twice re-elected, though each time by a smaller majority. During all the time he was in parliament, he was, though unsuccessfully, a strong advocate of vote by ballot. In 1843 Grote retired from banking and devoted his entire time to his *History of Greece*, the first two volumes of which appeared in 1846 and the twelfth and last in 1856. It met at once with general favor, and has taken rank as the fullest and most complete history of Greece. Until the time of his death, on June 18, 1871, he held the offices of president of University College and vice-chancellor of London University.

Grouchy (*grōō'shē'*), **Emanuel, Marquis de,** French general, was born at Paris, Oct. 23, 1766. He entered the army at 14, taking sides with the Revolution, and first smelled powder in aiding to put down the Vendean revolt. He also served as second to Hoche in Ireland and under Joubert in Italy in 1798. In Piedmont he was taken prisoner while under Moreau, but was exchanged in 1799, afterward fighting with great bravery at Hohenlinden, Eylau, Friedland, Wagram and in the Russian campaign of 1812, having command in the memorable retreat of Napoleon's body-guard. On Napoleon's return from Elba he was made a marshal of France, and, marching north, routed Blücher at Ligny. Keeping strictly to the letter of his orders, he refused to march to Waterloo, and so indirectly caused the defeat of Napoleon. After the defeat at Waterloo and Napoleon's second abdication, as commander-in-chief of the armies he led them back to Paris, resigned, and came to America. He returned to France in 1819, was reinstated as marshal in 1831, and died at St. Etienne on May 29, 1847.

Grouse, a common name loosely applied to quail, partridges and true grouse. It should be restricted to the grouse. These birds are distinguished from quail and partridges by having the legs, feet and nostrils feathered, with bare skin over the eyes. In summer the toes are bare, but in winter they put on their "snow-shoes" — most of them dwellers in regions of heavy snow-fall and these birds largely ground-hunters. They live in both Europe and North America, and there are about 24 species recognized. Grouse are among the favorite game-birds. In England parliament closes when grouse-shooting begins. The ruffled grouse is a common species in the United States. Its home is from Massachusetts and northern New York to northern Georgia. While not abundant west of the Mississippi, it is found as far as the Dakotas, and is essentially a forest bird. It gets its name from the black ruff it wears in front of the shoulders. The lower part of its legs is bare, this being the only grouse with bare legs. In color it is rusty brown with mottlings of black, gray and white. This bird is improperly called partridge in the north and pheasant in the south. The male produces a drumming sound by the use of its wings; standing on the trunk of a fallen tree or some other elevation, the wings are stretched horizontally and beaten stiffly downward, slowly at first, then increasing in speed until a sound like the roll of a drum is produced. This is to be distinguished from the booming sounds produced in other grouse by the air-sacs. The nest of the ruffled grouse is usually at the base of a tree or stump, and early in May from eight to 14 buff-colored eggs are to be found therein. The hen, when disturbed with her young, will limp and flutter about to distract attention from her chicks, these meanwhile hiding here and there, keeping very still when once secreted. Ruffled grouse, ground-birds with inconspicuous plumage, seek protec-

RED GROUSE

tion in hiding rather than in flight; but when taking to flight may make easy escape. Chapman in *Bird Life* says: "Quail, partridges and grouse, much to the amateur sportsman's discomfiture, spring from the ground as though thrown from a catapult, and reach their highest speed within a few yards from the starting-point."

The common prairie-hen or prairie-chicken, the pinnated grouse, at one time was very abundant in the wide prairie country; because of ignorance, carelessness and greed it now is nearly extinct. In common with other grouse it makes a booming sound in the spring by means of air-sacs located on the neck. The prairie sharp-tailed grouse belongs to the Great Plains, but, like the pinnated grouse, is fast disappearing. The sage-grouse, a cock-of-the-plains, feeds and thrives on sage-brush. It is the largest grouse found in America, a large male weighing about six pounds. It is a handsome, showy bird with an extremely long tail; on the side of the neck it has large air-sacs that produce a deep, hollow tone. The Canada grouse and blue grouse are other varieties, both sometimes spoken of as "Fool Hen" because of too-trusting ways. The ptarmigans (*tär'mi-gans*) are interesting members of the grouse family. With change of season these birds greatly change their appearance; snow-white in winter, in mid-summer their plumage is chestnut-brown barred with black. Ptarmigans are of great food-value to Eskimos and Indians, and have proved of help in time of need to various parties of Arctic explorers. They are found generally in Arctic America and Alaska. There are several species. A species found within the United States is known in Colorado as the white quail; another species is said to wander sometimes into northern New England. The red grouse (see illustration) of Scotland is a ptarmigan that does not turn white in winter. See PARTRIDGE and PHEASANT. See Hornaday: *American Natural History;* Abel Chapman: *Bird Life of the Borders;* and Frank Chapman: *Bird Life.*

Growth (in plants), permanent alteration of form, usually accompanied by increase in size, the latter being the only popular criterion of growth. In plants growth exhibits three features at different times. In the earlier phase the formation of new cells by division is characteristic. This is followed by the rapid enlargement of the cells. In doing this, the cells do not form a corresponding amount of new protoplasm, but take up large quantities of water, which is secreted into the center of the cell. The volume may thus be increased a thousandfold or more. In this feature the growth of plants differs most from that of animals. After enlargement has ceased, thickening (usually irregular) of the walls and sometimes the death and disappearance of the protoplasm ensue. The phase of enlargement is the only easily measurable phase of growth. It is studied by records or observations with the auxanometer (which see). Growth is dependent on a suitable supply of oxygen, food and water. It is greatly influenced in rate and amount by external agents, as heat, gravitation, light, etc. Because the heat and light vary periodically, corresponding to day and night, the rate of growth shows a daily variation, being usually most rapid during the night. Besides variations due to external causes, growth shows variations which are unexplained, but are supposed to be due to internal causes. Even when all the conditions affecting growth are uniform, its rate is at first slow, becoming more and more rapid till it reaches a maximum, after which it declines even more rapidly, until it ceases entirely. The duration of growth of any part is called the grand period to distinguish it from the daily period just mentioned. During both daily and grand periods, there also are minor variations in rate. The cause of the cessation of growth, even under favorable conditions, is not known.

Guadalajara (*gwä'thȧ-lȧ-hä'rȧ*), capital of the Mexican state of Jalisco, is the third city of the republic and lies in the valley of the Rio Grande de Santiago, 280 miles by rail from the city of Mexico. The city is beautifully laid out, has some fine public buildings, and is the chief seat of the cotton and woolen manufactures of the country as well as of pottery and metal wares. Population 118,799.

Guadalquivir (*ga̤'dȧl-kwĭv'ẽr*), meaning the great river, the largest river of Spain and the only one that all the year round has a full stream. It rises in the Sierra de Cazorla, flows 374 miles in a southwesterly direction, and empties into the Gulf of Cadiz. It is a slow, sluggish stream, only breaking into rapids near the Sierra Morena. It is navigable as far as Seville, 80 miles from its mouth.

Guadeloupe (*ga̤'dȧ-lo͞op'*), an island, one of the Lesser Antilles in the West Indies and the most important of those belonging to France. It is about 77 miles northwest of Martinique. It covers 494 square miles, and is divided into Grand-Terre on the east and Basse-Terre on the west by a strait called Salt River. Grand-Terre is a coral island. Earthquakes are frequent, and in the towns the houses are now built of wood or iron. Sugar and coffee are exported. The colony has a French governor. The island was discovered by Columbus in 1493, and colonized by the French in 1635. The area of the two islands is 583 square miles, with an estimated population of 182,000, including about 15,000 coolies. The chief town is Point-à-Pitre (population 18,000), with a fine harbor. The seat of government is Basse-Terre (population 8,000). The chief products consist of sugar, coffee, cacao, bananas, manioc, sweet potatoes, Indian corn and tobacco.

Guam (*gwäm*), the largest of the Ladrone or Marianne Islands in the north Pacific, ceded by Spain to the United States by the treaty of Paris, Dec. 10, 1898. The island is about 32 miles in length by 6 in width, and lies 1,500 miles from Manila and 4,000 from Honolulu. It is useful as a coaling station, possesses a good roadstead and about 12,000 of a population. It is a direct link in the chain of possessions between the United States (port of San Francisco) and the Philippine Islands. The climate is humid but salubrious, and the heat is tempered by the trade-winds. The capital is Agaña (pop. 6,000).

Guanajuato (*gwä-nä-hwä'tô*), capital of the state of Guanajuato, Mexico, is built on both sides of a deep ravine in the center of the large mining-district of the state. Its streets are narrow, steep and winding, although its houses are well-built and homelike. It is the seat of a great silvermining industry. The area of the state is 11,370 square miles, with a population estimated at 1,075,270. Population of Guanajuato, the capital, 35,147.

Guano (*gwä'nō*) and **Guano Islands.** Guano is the deposit of sea-fowl, found in immense quantities on certain coasts and islands where the climate is dry and free from rain. Its value in agriculture was well-known to the Peruvians long before the coming of the Spaniards. Alexander von Humboldt first brought specimens of guano to Europe in 1804. There are three classes of guanos: (1) those which have suffered little by the action of the air, retaining nearly all of their original matter, such as the Angamos and Peruvian guanos; (2) those which have lost a considerable portion of their soluble matter, but remain rich in their less soluble ones — the phosphates of lime and magnesia, as the Ichaboe, Bolivian and Chilean guanos; and (3) those which have lost nearly all their ammonia and contain but little more than the earthy phosphates of the animal deposit; in this last class must be placed the various African guanos and the West Indian, Kuria Muria (islands off the coast of Arabia), Sombrero, Patagonian and Shark's Bay guanos (Australia). Most of the so-called Peruvian guano has been obtained from the Chincha Islands off the coast of Peru. These are three small islands, often called the Guano Islands. Here multitudes of penguins and other oceanic birds build nests and breed, and large deposits of guano have accumulated. Not one of these islands covers more than a mile. They are rocky cliffs, some 300 feet high, with many caves into which the waves dash. The whole supply of guano on these islands is now exhausted.

If the value of manure be calculated, as is done by chemists, according to the amount of nitrogen which it contains, one ton of good Peruvian guano is equal to 33½ tons of farmyard manure. Its value as a manure has become so well known and its use is so great, that it is gradually being used up.

Fish-guano is dried fish ground to powder. Mussels, five-fingers or starfish, herrings and particularly sprats are mostly used in this way. In 1862 the refuse of the Norwegian cod-fisheries was first used by drying the heads and backbones upon heated floors after sun-drying them on the rocks, then grinding them to powder between mill-stones. Fish-guano has grown rapidly in favor of late years among farmers, the supplies of guano proper being practically used up, and is the best-known substitute for the Peruvian guano. One ton of fish guano is said to be equal to 17 tons of farmyard manure. Guano is made in Canada and elsewhere from lobster and crab shells, which is said to be very valuable for gardens. The annual production of fish-guano from all sources, England, Scotland, Norway, Sweden, Newfoundland, Nova Scotia and the United States, is estimated at 75,000 tons.

Guantanamo (*gwån-tä'nå-mō*) **Bay,** an excellent bay and harbor on the southern coast of Cuba, about 40 miles east of Santiago, the scene of a historic engagement in the middle of June, 1898, between the Spanish and the United States troops, marines, war-vessels and transports. The American marines effected a landing and established and fortified Camp McCalla. This they held for several days against a superior force, until, aided by shells from the warships, the enemy was driven off. Guantanamo City, on the Guasco River, province of Santiago de Cuba, about 13 miles by rail north of its port, Caimanera, on the Bay of Guantanamo, has a population of about 7,250; while that of the district is close upon 30,000.

Guasimas (*gwäs'e-mäs*), **Las, Cuba,** the scene of a memorable engagement in the Spanish-American War, which occurred, June 24, 1898, at Las Guasimas, near Siboney, close to the landing point at Daiquiri, about 20 miles east of Santiago on the southern coast of Cuba. The conflict was between a Spanish force of 2,000 to 3,000, concealed in a dense jungle, and General Young's brigade of dismounted American cavalry, the brunt of the fighting being borne by a battalion of 450 men of Colonel Roosevelt's regiment of Rough Riders (volunteers) and 400 Regulars. The victory, though dearly bought, rested with the Americans, the Spanish, confused and disheartened, fleeing precipitately from the field.

Guatemala (*gä'tē-mä'lå*), a Central American republic (established in 1847), lying just south of Mexico and between the Gulf of Honduras and the Pacific. Its estimated area is 48,290 square miles, but the greater part is yet unexplored, thus making maps merely guess-work.

Surface and Drainage. The country is mountainous, and has several volcanoes, the most noted of which is Fuego (12,075 feet in height). Guatemala is well-watered and drained by its principal rivers, the Usumacinta, Polochic and Motagua. Its valleys are noted for their beauty and fertility. Its climate is warm, pleasant and generally healthy, its rainy season extending from April to October.

Natural Resources. Unexplored as it is, Guatemala has not yet developed the richness of its mineral resources; but gold, silver, iron, copper, coal, quicksilver, gypsum, salt and saltpeter are mined to some extent, while perhaps its greatest wealth lies in the richness of its soil.

Exports and Manufactures. Its chief exports are coffee, sugar, cacao, tobacco, cotton, sisal hemp, sarsaparilla and fruits. Its principal manufactures are woven fabrics, pottery and saddlery. The revenue in one recent year amounted to $34,000,000, and the expenditure to about $20,500,000. The military force under arms numbered 7,000 officers and men, besides the reserve.

Education. Free primary schools, of which there are 1,064, are being established and these have about 36,500 pupils. The capital is Guatemala la Nueva (pop. 96,560).

Inhabitants. About one third of its population is said to be of European descent and the remainder native; but this division is hardly correct, as it fails to take into account the many mixed and halfbreeds, which cannot be properly classified. The entire population numbers 1,992,000, about 60 per cent. being pure Indian.

History. Guatemala was conquered by Cortes in 1524, and for three centuries remained under a harsh rule before independence was declared. A confederacy, formed in 1821, was maintained until 1839, when it was conquered by Rafael Carrera, an ignorant Indian, who ruled until his death in 1865. During the presidency of General Barrios, from 1871 till 1885, the country made considerable progress in every direction. Its president to-day (1908) is Don Manuel Estrado Cabrera. The legislative power is, together with the executive, vested in the president and the national assembly. See Keane's *Central and South America* and Brigham's *Guatemala.*

Guayaquil (*gwī'ȧ-kēl'*), the capital of the province of Guayas, on the river of the same name, in the republic of Ecuador, South America. It lies at the head of an estuary of the Gulf of Guayaquil, about 170 miles south-southwest of Quito, and is the chief seaport of the republic. The city is well-laid out, and is adorned with a handsome cathedral, a university, bishop's palace and other fine edifices, though its low, swampy ground makes it unhealthy. It is subject to earthquake shocks, and its lack of good drinking-water produces epidemics of yellow fever. Its exports include cocoa, coffee, cotton, hides, rubber and nuts. The Guayaquil and Quito Railroad is now open from Duran (opposite Guayaquil) to Riobamba, while motor-cars run also from Quito to Riobamba. Population in the neighborhood of 80,000.

Guelph, in the county of Wellington, Ontario, has a population of 14,789. Sometimes it is called, because of its name, The Royal City. It owns its waterworks, gas and electric lighting works. Its park on the banks of the Speed is much admired. It is chiefly known because of the agricultural college located there. This college gives instruction in subjects connected with agriculture, combining practical and scientific work, to 800 students. Every alternate afternoon the students are required to take part in practical farming operations. The farm itself in connection with it contains 350 acres. The dairy-school is one of the best of the kind in any country. Graduates of this school are to be found holding high positions as professors and teachers all over the continent. The Macdonald Institute (founded by Sir William Macdonald of Montreal), in which teachers of home-science are trained, is located here. Guelph is the live-stock center of the province. Important manufacturing industries (carpets, organs, agricultural implements, etc.) are profitably established here.

Guelphs (*gwelfs*) and **Ghibellines** (*gib'e-linz*), the names of two great parties, the conflict between whom forms a great part of the history of Italy and Germany from the 11th to the 14th century. The Guelphs composed the papal and popular party; the Ghibellines the aristocratic and imperial party. The names come originally from Welf and Waiblingen, the names of two German families, the former being still represented in the house now ruling in England. The names, as applied to the parties, came into use from the era of the battle of Weinsberg, fought in 1140 between Emperor Conrad and Welf. In this contest the cities of Italy took sides, Florence, Bologna, Milan, Modena, Ravenna and others siding with the Guelphs, while Pisa, Lucca and Arezzo were Ghibelline. The northern cities, as a rule, were Ghibelline, while the central and southern inclined toward the Guelphs, although all, as well as the leading Italian families, shifted and changed as occasion and interest required. This continued for years, until the mention of either name became a general signal for bitter personal warfare, the people no longer fighting from principle but from habit See Bryce's *The Holy Roman Em-*

pire and Browning's *Guelphs and Ghibellines.*

Guiana (*gē-ä′nȧ*), a country in South America, lying between the Orinoco and the Amazon, with the Atlantic Ocean on the east. It is properly divided into five sections, but two of these are united with Brazil and Venezuela, the other three being British, Dutch and French Guiana.

Surface. There is a narrow strip of fertile soil bordering on the Atlantic, and in this lies the only agricultural wealth of the country. The rest forms a series of terraces and low mountains, in no place reaching a height of over 3,200 feet.

Climate and Drainage. The climate is hot and moist, the average temperature being 80° to 84° F., and the rainfall from 75 to 100 inches in British and Dutch Guiana and about 140 inches annually in French Guiana. The rivers of the country are many, forming a large chain crossed at their upper parts by many channels and canals, thus affording abundant irrigation, but are with difficulty navigated on account of mud-banks, sand-banks and rapids.

British Guiana or Demerara, with a coast-line of 320 miles, is separated from Dutch Guiana by the Corentyn River, the other boundaries on the south and west being yet unsettled. The total area, including the settlements of Demerara, Essequibo and Berbice, is 90,277 square miles. In the west there are two mountain-ranges running from west to east, the whole forming the Pacaraima or Parima mountain-system. Among the larger rivers are the Corentyn, Berbice, Demerara, Essequibo, Waini and Barima, all flowing north into the Atlantic. The chief exports are sugar, rum, molasses, timber, shingles, cocoanuts, charcoal and gums. The population, amounting to 305,090 in 1909, consisted of Europeans, creoles, negroes, coolies, natives of the Azores and about 7,650 Indians. The colony is divided into three counties, with the government at the capital, Georgetown (pop. 53,176), in the hands of a governor appointed by the crown and two legislative councils. New Amsterdam at the mouth of the Berbice River is a growing settlement. Besides the river-navigation, 450 miles in extent, there are some 40 miles of railway. The dispute between Britain and Venezuela over the international boundary was settled by arbitration, Oct. 3, 1899. British Guiana is rich in gold, the product of which in 1910-11 was 54,989 ounces, valued at $1,002,400. The revenue for the same year amounted to $2,815,000 and the expenditure to $2,714,000; while the exports were close upon $8,650,000 and the imports amounted to $8,750,000.

Dutch Guiana or Surinam, with a coast-line of about 240 miles and an area of 46,058 square miles, is bounded on the west by the Corentyn River, on the east by the Maroni River and on the south by the Acarai Mountains. Its other rivers are the Surinam, Soramacca, Coppename and Nickerice, all flowing into the Atlantic. The exports are bananas, sugar, rum, molasses and cocoa, although the total cultivated area is only about 210 square miles. Gold is also one of the exports since the discovery in 1875. Surinam's capital is Paramaribo (population 34,795), where resides the governor at the head of an executive council. The population in 1909 was 82,739, besides 4,000 negroes and 1,200 Indians. Slavery was abolished in 1863.

French Guiana or Cayenne, with a coast-line of about 240 miles and an area of 30,500 square miles, is separated from Dutch Guiana on the west by the Maroni and from Brazil by the Tumuc-Humac Mountains and the Oyapoc River. The other rivers are the Mana, Sinnamary, Kourou and Apporonague. The commerce of the country is almost nil. The country is unhealthy, and the number of inhabitants is gradually diminishing. The entire population in 1911 was 49,009. The area of the colony is 30,500 square miles; the capital is Cayenne (pop. 12,798). From 1853 to 1864 there was an attempt to found a penal colony, but on account of the unhealthiness of the climate it failed, partially, though in 1910 there was a penal population of more than six thousand. In 1909 the revenue and expenditure budget balanced at about 3,497,000 francs, independently of what the mother-country expends on the penal establishment.

History. Guiana was first explored by Europeans in 1499 and 1500; but the first permanent settlements were made by the Dutch about 1613 at Essequibo, by the English at Surinam in 1650 and by the French at Oyapoc in 1626. See *British Guiana* by Bronkhurst and *Dutch Guiana* by Palgrave.

Gui′do Aretin′us or **Guido d' Arezzo** (*gwē′-dô ȧ-rĕt′sô*) (995–1050), was the first to use movable *do.* He is credited with the invention of the principle upon which the stave is constructed and with the *F* and *C* clefs. The claim to other inventions attributed to him is uncertain.

Guild (*gĭld*), the name of an association, many of which were formed and flourished during the middle ages. The exact purpose of the guild cannot be determined, inasmuch as it bore no resemblance whatever to the trades' union of to-day, although it consisted of an association of the merchant and industrial classes. Guilds are first mentioned in England in the 7th century and on the continent in the time of Charlemagne in 779. They were divided mainly into two classes: the merchant-guilds and the craft-guilds or, as we should call them, trade-guilds. The merchant's guild protected the business of its members, and opened and created markets for their wares. The craft-guild took care of the interests of its members, and saw that each one was skilled in the trade that the guild represented. On the whole, the guilds were useful in equalizing and harmonizing the interests of the producer and consumer. The first decisive move against guilds was made in England by Henry VIII, who confiscated all their property. They were abolished by legislation in England in 1535; in France in 1789; and in Germany in 1869. See *History and Development of Guilds* by Brentano; *Guilds, Their Origin and Constitution*, by Walford.

Guillotine (*gĭl′lô-tēn′*), an instrument used for beheading, was introduced by the convention during the French Revolution. It was named after its inventor, Joseph Ignace Guillotin. It was first erected in the Place de Gréve, Paris, on April 25, 1792, and was used to execute a highwayman. The guillotine is made of two grooved, upright posts, with a cross-beam at the top. In the grooves runs a heavy iron knife, with a slanting edge, which descends by its own weight upon the neck of the victim, who is bound to a board. An instrument of a like nature is said to have been used in Persia and in Italy, and during the 16th and 17th centuries one, called the *Maiden*, was in use in Scotland. It is popularly supposed that the inventor died by his own instrument; but in truth he died in bed in 1814. See *History of the Guillotine* by Crooker.

Guin′ea-Fowl, the name given to the common domestic guinea-hen and to its wild relatives. The domestic variety is commonly seen in poultry yards in the United States. The birds have a full body, a small head and short tail; their plumage is usually dark gray, marked with small white spots. These came originally from wild African birds, common in Guinea and southward toward the Cape. They are also found in the northern part of Africa, having been known to the Romans. The wild guinea-fowls are of three kinds — those with a crest of feathers on the head; those with a bony helmet and bare heads; and those with a patch of feathers on the back of the head. The crested variety is more graceful than the others; their plumage is black, dotted with small bluish-white or light green spots. The skin of the neck is bare, bluish in color and sometimes ornamented with bright red. The helmeted variety, from which the domestic form is derived, go in large flocks. They are very noisy, fast runners, wild and wary. Some species of this kind live also in Madagascar. They destroy many insects. A similar bird occurs in Jamaica, where they are destructive to crops and are shot like other game.

Guinea, French, is situated on the western coast of tropical Africa between Portuguese Guinea and the British colony of Sierra Leone, extending inland to the headquarters of the Gambia and the Senegal. Area about 95,000 square miles; estimated population 1,498,000. The country is administered for France by a governor, the capital being Konakry on the Isle of Tombo. Products: rice, gum, palm-oil, nuts, coffee and rubber. The colony was acquired by France in 1843.

Portuguese Guinea is situated on the coast of Senegambia, and includes the adjacent archipelago of Bissagos, with the island of Bolamo, in which the capital of the same name is situated. The chief port is Bissao. The chief commercial products are rubber, wax, oil, seeds, ivory and hides. The area of the dependency is 13,940 square miles, with a population estimated at 820,000.

Guinea (*gĭn′ē*), **Gulf of,** a part of the Atlantic Ocean, forming a large angle on the west coast of Africa between Cape Palmas and Cape Lopez. It receives the delta of the Niger on the northeast; while on the east are the islands of Fernando Po, Prince and St. Thomas.

Guinea-Pig, the popular name for a South American animal related to hares and rabbits. Its name is a curious mistake. It in no sense is a pig, and it does not occur in Guinea, but in Guiana, Bolivia, Brazil and some other parts of South America. Its common name is the cavy. The animal was domesticated in Europe in the 16th century, and is frequently seen in the United States. The animal has short incisor teeth and a very short or rudimentary tail. It lives wholly on vegetable food, and while feeding generally sits on the hind feet. It lives in burrows, and feeds at dusk and on dark days. It breeds with great rapidity, and is capable of bearing young when a few months old.

Guiscard (*gḗs′kär′*), **Robert,** duke of Apulia and Calabria, the sixth son of Tancred de Hauteville, was born in Normandy about 1015. He won great renown as a soldier in Italy, and after the death of his brother was proclaimed count of Apulia. He captured the Italian provinces of Reggio and Cosenza, thus conquering Calabria, and was confirmed in possession by Pope Nicholas II. He now waged war on behalf of the pope, gradually defeating the Saracens in Italy and in Sicily. Later he was occupied in defending Michael VII of Constantinople (whose son Robert's daughter had married) from Alexius Comnenus, whom he defeated at Durazzo in 1081. He then proceeded toward Constantinople, but, hearing that Henry IV was in Italy, he hurried back and liberated the pope from St. Angelo, where he was besieged in 1084. Robert then returned to Epirus, defeating the Greeks, but, while in Cephalonia on his way to Constantinople, he died suddenly on July 17, 1085. See *The Normans in Europe* by A. H. Johnson.

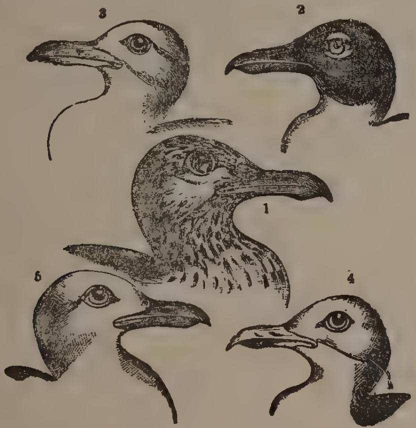
Guise (*gü-ēz*), **Henry, Duke,** of the family of Lorraine, a son of Francis, was born on Dec. 31 ,1550. The murder of his father by the Protestants filled him with bitter hatred toward them, and he fought against them at Jarnac in March, 1569, and at Moncontour in October, 1569, and forced Coligni to raise the siege of Poitiers. He was one of those who brought about the massacre of St. Bartholomew, Aug. 24, 1572. He was ambitious to become king, in place of Henry III, whom he defied and humilated to such an extent that the king procured Guise's assassination at Blois on Dec. 23, 1588. See *History of France* by Guizot and that by Yonge.

Guitar (*gĭ-tär'*), a stringed musical instrument resembling the lute, well-adapted as an accompaniment to the voice in singing and much used in Italy and Spain. It was introduced into Spain by the Moors. It has six strings, which are twitched by the fingers of the right hand, while those of the left hand make the notes of the music by being pressed on the fingerboard, which has frets (metal strips dividing it into notes) across it. The three highest strings are always of gut, the three lowest of silk spun over with silvered wire.

Guizot (*gē̆'zō'*), **François Pierre Guillaume,** a French historian and statesman, was born at Nîmes, France, of Huguenot parentage, Oct. 4, 1787. His father was guillotined in 1794, whereupon his mother took him to Geneva, where he was carefully educated, but he returned to Paris to study law in 1805. In 1809 he attracted attention by his review of Chateaubriand's *Martyrs*, followed by the *New Dictionary of Synonyms*, by an essay on the fine arts and in 1812 by a translation of Gibbon. He was appointed professor of modern history in the University of France shortly afterward. On the fall of Napoleon in 1814, Guizot was made secretary-general of the ministry of the interior, then secretary-general of the ministry of justice and in 1816 director-general and counselor of state. But in 1821, finding himself at odds with the Bourbon policy, he was deprived of all his offices, and four years later was prevented even from lecturing. He then published his *History of France* and *History of the Revolution in England.* In 1828 he was restored to his college-chair, and his lectures on the history of civilization in England, Europe and France, published as a *Course of Modern History*, made his reputation as one of the first historians of the day. In 1830 he returned to political life and held several important offices, being ambassador to England in 1840 and prime-minister in 1847. When minister of public instruction, he established a system of primary schools. On the fall of Louis Philippe in 1848, he escaped to London, but returned to Normandy during the Second Empire, devoting all his leisure to literature. He died in Normandy, Oct. 12, 1874. See *Private Life* by Madame Guizot de Witt and *Memoirs* by himself.

Gulf Stream, the largest and best known of all oceanic currents, derives its name from the Gulf of Mexico, out of which it flows as a stream of warm water along the east coast of the United States to Newfoundland, whence it takes a diagonal course across the Atlantic. This flowing of an independent and separate stream in a large body of water is caused by the action of the prevailing winds of the globe. In the Atlantic the waters near the equator are forced by the winds into the Caribbean Sea, through the Yucatan Channel, into the Gulf of Mexico, which is three feet four inches higher than the waters around Sandy Hook. This is occasioned by part of the force keeping up the flow of the Gulf Stream. The Gulf Stream varies from 50 miles in width to 300 at Sandy Hook, there spreading out in the shape of a fan. It travels from about six miles per hour at the Straits of Florida to three or four miles per day at its widest part in the Atlantic. It is divided into two parts off the coast of Europe, one part passing along the coast of Norway to the Arctic Ocean and the other along the coast of Spain and Africa. As it enters the colder waters, it sinks below the surface on account of its greater density, and is therefore warmer below the surface at Great Britain than off the coast of Africa. Its surface temperature averages about 77.5° F.

Gull, a long-winged water-bird with web-feet, inhabiting all parts of the world. The group to which gulls belong embraces also the terns, and these two kinds of birds are closely related. There is a popular notion that gulls have an undivided tail and the terns a forked one; this holds good for most forms, but not for all, as some gulls have forked tails and some terns wedge-shaped tails. There are about 100 species of these birds — 50 gulls and 50 terns. These graceful birds are seen flying over the water, both on large fresh-water lakes and at the sea-coast. Their cry is a scream, loud and powerful. No birds are more widely distributed than gulls and terns. One on a voyage, either on the Great Lakes or the ocean, is sure to see them flying about the vessel for remnants thrown overboard from the cook's galley. They are beneficial as scavengers, for they dispose of refuse floating on the water which might do harm if cast ashore. The gulls are larger and stouter than the terns. The predominating colors in both birds are white and gray, varying in shade. The feet and bill are usually brightly colored, frequently yellow or red. They feed on fish, floating scraps and, along the coast, on mollusks, the shells of which are broken by being carried to a height and allowed to fall. The common gull of North America is the herring-gull, abundant in bays and harbors, seen far at sea and also ranging far inland. Its winter home is in the United States; it nests from southern Maine to the Arctic Ocean. The common terns, frequently seen on Lake Michigan and the other Great Lakes, are most graceful birds in flight, and are often called sea-swallows. They are more slender than gulls, and have long forked tails and slender bills. These beautiful birds have been destroyed in immense numbers for trimming ladies' hats, but a crusade has been effectively waged against the wanton destruction and the birds are being saved from extermination. See TERNS.



HEADS OF GULLS

(1) Great black-backed. (2) Black-headed. (3) Killiwake. (4) Small black-backed. (5) Herring-gull.

Gun, a term often used to describe all firearms and still applied to cannon and other large artillery, though strictly it is limited to the sporting-gun or modern shotgun. The early firearms brought into use by the invention of gunpowder were known under different names; as "bombards" in Italy, "crackeys" in England, etc. In the 15th century they began to be grouped in classes. Bombards were short vessels from which stone balls were shot, and were the forerunners of the present bombs and mortars. Cannon were not much larger than the muskets of the 18th century. Culverins were cannon, and fired stone, shot, iron and leaden balls; these were used in England until after the Commonwealth. There also were hand-culverins used on horseback, weighing about 15 pounds, and some weighing 60 pounds were used by foot-soldiers. The "culverineer" needed a servant to help him to fire it, as the gun was supported on a forked rest. He had to carry, besides the gun, a flask of coarse powder for loading, one of fine powder for priming, a bag of bullets, a musket rest and a burning match. From improvements in the culverin the match-lock was developed, with its varieties of arquebus, hackbutt and musket. These early firearms were loaded with difficulty, as they had to be placed on the forked rest attached to the gunner's wrist, and the match, a slow-burning fuse, gave a great deal of trouble in damp weather. In a battle in 1638 the musketeers fired only seven shots in eight hours. The firelock or flintlock, with its new method of firing, was introduced in Spain about 1625, and is said to have been the invention of highwaymen, as the burning match dangerously betrayed their presence. It was used in the English army from about 1688 to 1840. The first pistols were made in 1540, and were first used as concealed weapons. Double and four-barreled pistols were common in the 18th century, and the revolving pistol, called the "pepper-box," preceded the modern revolver. About 1890 it began to look as if an automatic pistol would replace even the seven-cartridge revolver. The best known sorts are the Burchardt-Luger, Colt, Männlicher and Mauser. The gas made by firing operates the mechanism. It opens the breech, extracts and expels the cartridge, and reloads and recloses the breech. The man merely refills the chamber and pulls the trigger. The Burchardt fires 48 shots in 28 seconds. But a revolver has been invented that almost equals an automatic pistol in rapidity of fire, and also uses regular ammunition. The shotgun or sporting rifle is carried to the greatest perfection in England. The range is about 45 yards, and the shot will strike a target 120 feet distant in thirteen hundredths of a second after pulling the trigger. Smokeless powder is used in these guns. The finest shotguns, made by the best-known gunsmiths, are valued at $200 apiece. The introduction of smokeless powder opened a new era. The newest model of the United States Springfield rifle surpasses that of 1892. It has a magazine, like a box, that is situated under the receiver. The cartridges are loaded from a clip. Twenty shots have been fired in 28⅝ seconds. The bullet travels 2,300 feet a second, penetrating 4½ feet of white pine, and the range is five miles. The new Springfield is almost one tenth faster than the old one, and nearly one fifth more accurate. Its only equal is the 1903 Mauser. Some armies are replacing their magazine-rifles with automatic rifles. The Woodgate automatic rifle holds 20 cartridges, fires 200 rounds a minute, and can be fitted to old makes. The Maxim automatic, firing 600 rounds per minute, is a notable machine gun: the one-pounder Maxim-Nordenfeldt (automatic) gun was in use in the Spanish-American War and has been adopted in the U. S. navy. Other machine-guns in use are the Gardner and the Colt gun, the Hotchkiss two and 12-pounder mountain-guns. The modern improvements in guns are largely in what are known as quickfiring or machine-guns. The guns used in Europe are made chiefly at the Krupp works or by Sir William Armstrong in Newcastle, England, whose guns are equally famous. See CANNON, RIFLE, REVOLVER and ARTILLERY. See *The Gun and Its Development* by Greener; *Modern Shotguns* by the same; and *American Inventions and Improvements in Small Arms, Machine-Guns etc* by General Norton.

Gun' boat, a small vessel armed with large guns and principally used for service on the coast and in rivers. In their more modern form they have one large gun in the bow, pointed by a helm or by screws, these being only a floating gun-carriage. In 1907 the United States navy had 37 gunboats and in the same year Great Britain had 36.

Gun'cot'ton is an explosive substance made from cotton-wool. The first experiments were made by Schonbein, a German chemist, in 1845, who found that cotton-wool, dipped in a solution of nitric and sulphuric acids, could easily be set on fire, and while burning would explode. He called the new compound guncotton and proposed its use in place of gunpowder. Many experiments followed the discovery, and several attempts were made to introduce it into use. Its principal advantages over gunpowder are that it is not injured by water, and so it can be carried in a damp state, which makes it perfectly safe, and that it is smokeless. It is used in war largely for torpedoes and in mines. It is now used, after many unsuccessful attempts, as a constituent of certain smokeless powders. In the pure condition its explosion is too violent for use in guns, but by proper additions of other substances its speed of burning may be retarded. See *Handbook to Modern Explosives* by Eissler.

Gun'nery is the system of laws which regulates the making and using of all kinds of firearms, though the term "musketry" is sometimes given to the scientific use of small arms. The first book on the subject was written by an Italian mathematician, Tartoglia, who published his *New Science* in 1537. He also invented the gunner's quadrant. Galileo followed with his *Dialogues on Motion* in 1638. The real founder of the science was Benjamin Robbins, whose *New Principles of Gunnery*, published in 1742, treated of the force of gunpowder, the resistance of the atmosphere, etc. His invention for measuring the velocity of a cannon ball was used until superseded in 1862. In the use of firearms many problems have to be solved, and it has become one of the exact sciences. By means of mathematical tables and other instruments the proper length, thickness and size of a gun, the charge, form of the ball, the time of flight, distance to which it will reach and elevation required for any range are all calculated, and every gun has its range-table, as it is called, set forth with all these items for the gunner's use. See CANNON, RIFLE and GUN. See *Textbook of Gunnery* by Mackinlay.

Gun'powder, an explosive mixture of saltpeter, charcoal and sulphur, well-known all over the world. The proportions of these materials used vary in different kinds of powder, as also in various countries. Its origin and early history are obscure. Fireworks were known in China at a very early period, but whether the Chinese or any other Asiatic people invented modern gunpowder is doubtful. It was, in any case, left for more western nations to develop the discovery of the Chinese; we find it first used by the Byzantine emperors, under the name of Greek fire, in the defense of Constantinople against the Saracens in the 7th century. Its first use in Europe in its present form was in Spain, both by Christians and Moors, in the 12th century, who had some rude sort of artillery. Roger Bacon first introduced it into England. This was early in the 13th century, but its preparation was so imperfect that it was of no use, until a German monk, Berthold Schwarz, about 1320 introduced a new method of manufacture. From that time the use of gunpowder became general throughout Europe, the Russians, who in 1889 celebrated the 500th anniversary of its introduction into Russia, being the last to adopt it. In Queen Elizabeth's reign its manufacture was commenced in England, the great bulk used there having been obtained from abroad. At Waltham Abbey, a market town in Essex on the Lea River, 12 miles north of London, are the English government's gun-factory, gunpowder mills and large corditeworks. The English royal laboratory and ordnance-factories are at Woolwich. The materials used in making gunpowder — saltpeter, charcoal and sulphur — are first ground very fine, then mixed by hand in the proportion of 75 per cent. of saltpeter, 15 of charcoal and 10 of sulphur. When mixed they are wet, and worked in a powder-mill into a cake called a mill-cake, which is crushed into meal. This meal is again pressed into cakes, and the cakes broken into pieces and passed through a machine, which forms the powder into grains. It is then sifted, dusted, glazed, and dried in a hot drying-room. These processes vary as different kinds of powder are wanted. In the last few years there have been many improvements in firearms, and with these changes has arisen a demand for new varieties in gunpowder — especially for smokeless powder. This is a high powered explosive used as a substitute for gunpowder in firearms and cannon. It is a compound of guncotton and cellulose nitrate, the latter consisting of sawdust which has been soaked in nitric and sulphuric acid. Smokeless powder, as indicated by its name, makes no smoke or very little, and does not foul the gun as does gunpowder.

Powder is classified according to the size, shape or structure of its grains; as mealed, superfine, fine, large or coarse, cubical, hexagonal, spherohexagonal, etc. See GUNCOTTON and Thomson's *Dictionary of Explosives* and *Treatise on Ammunition.*

Gunpowder Plot. This plot was planned by Robert Catesby, a Roman Catholic gentleman of England, who, with his fellow-conspirators, had been driven to desperation by the faithlessness of King James I. James had, before his accession to the throne, led the Roman Catholics to expect some degree of religious toleration, but shortly after he began to reign he not only put the penal laws against Catholics in full force, but showed an inclination to increase their severity. Early in 1604 Catesby told his plan to John Wright and Thomas Winter, and they brought over from Flanders a brave soldier serving in the Spanish army, named Guy Fawkes, who, together with one Percy, was admitted to the plot after taking an oath of secrecy. The plot was to destroy at one blow the king and both houses of parliament and at the same time raise an insurrection in the midland counties. On the 24th of May, therefore, Percy rented a room adjoining the parliament house, which they intended to undermine. But, because of the closing of parliament, the work was put off until December, when digging was begun. The work proved harder than expected and the men changed their plan, admitting new conspirators and renting a cellar under the house of lords, where they hid casks of gunpowder with faggots. Everything was ready by May. But the plot was betrayed. Guy Fawkes entered the cellar a little before midnight on Nov. 4 to start the flames, and was arrested. Catesby hurried to Warwickshire to raise his friends there. They were there attacked a few days later, Catesby and several others were killed, and the prisoners taken were committed for trial and the whole plot revealed by their confessions. The trial proved that the Roman Catholics, with the exception of the few engaged in the plot, had nothing to do with it.

Gunsau'lus, Frank Wakeley, a Congregational clergyman and educator, was born in Ohio, Jan. 1, 1856; graduated at Ohio Wesleyan University in 1875; and was ordained to the Methodist ministry. He has been pastor of Congregational churches in Columbus, Ohio; Baltimore, Maryland; and Chicago, Illinois. In 1899 he accepted the pastorate of Central Church, Chicago, the famous independent church of David Swing, and for some years before he had also been the first president of Armour Institute of Technology, resigning this post in 1901. He likewise is an eloquent and popular platform-speaker, his oratory being of the Spanish or rhetorical class, and is the author of the valuable historical romance *Monk and Knight*, a tale of the Renaissance and Reformation.

Gusta'vus I or **Gusta'vus Va'sa,** king of Sweden during 1523–60, was born in 1496 of a noble family named Ericsson. As a boy he was active in the struggle against Denmark, and was carried off with other nobles to be held as hostages in Denmark. He, however, escaped, and, returning in a roundabout way, tried to revive the waning interest in the struggle with the Danes, but could not, and had to resort to work in the fields and mines for a livelihood. At last the "blood-bath" of Stockholm in 1520 aroused the Swedes, and he raised a sufficiently large army to wrest city after city from the Danes, until finally the capture of Stockholm in 1523 drove them from Sweden. That same year he was elected king. He then devoted himself to restoring the country, fostering trade at home and abroad, and building roads, bridges and canals. He died on Sept. 29, 1560, leaving his country with an army of 15,000 men, a good fleet, a full treasury and many schools and colleges. The first efforts at Christianizing Lapland and Finland were due to him. See *The Swedish Revolution under Gustavus Vasa* by Watson.

Gustavus II or **Gustavus Adolphus,** king of Sweden from 1611 to 1632, was born at Stockholm, Dec. 19, 1594. He was highly educated, knew eight languages and was a fine musician. Upon coming to the throne, when 17, he found his country involved in wars and internal quarrels; and reorganized his government by promising the nobles their privileges, subject to military service to the crown. He then defeated Denmark, and in 1617 concluded peace with Russia, recovering many cities which had been lost. In 1618 he traveled secretly through Germany, and two years later he married the daughter of the elector of Brandenburg. He next turned his attention to Poland, ending the dispute by a six years' truce in 1629. In 1630 Gustavus marched into Germany at the head of 15,000 men to join the Protestants against the Catholic League. The German forces were under the command of Tilly and Wallenstein, but the latter was soon removed from the service. Gustavus waited long for the Protestant princes to join him, but they did not do so until Tilly had taken the rich city of Magdeburg and burned everything but the cathedral. Soon after, Gustavus defeated Tilly at Breitenfeld, took the

Palatinate and Mainz, and in 1632 defeated Tilly at the Lech. Then the emperor, Ferdinand II of Austria, recalled Wallenstein, who raised an army of 60,000 and advanced to Nuremberg to await the Swedish army on its way to Vienna. On Nov. 6, 1632, at Lützen near Leipsic, they came together in a dense fog, and Gustavus, becoming separated from the cavalry at whose head he rode, was surrounded by a body of Croats and killed. He was the great hero of the Thirty Years' War. See *Memoir* by J. L. Stevens; *Gustavus Adolphus in Germany* by French; and Schiller's *Thirty Years' War.*

Gus'tavus V, king of Sweden, was born on June 6, 1858, and became king on December 8, 1907, at the death of Oscar his father. In 1881 he married a daughter of the duke of Baden, thus uniting the rights of his house with the claims of the House of Vasa, as his wife is a descendant of the last Vasa king. As regent frequently after 1896, when King Oscar was sick or absent, he displayed qualities that changed public opinion from suspicion to respect. But estimates of his character and future policy differ. As most of his friends are business men and he is not intellectual and artistic like his father, he will probably be a more practical ruler. It is declared that he has no tendency to tyranny, and it is asserted that in foreign policy he leans to Germany.

Gutenberg (*gōō'ten-bĕrg*), **Johannes,** the inventor of printing with movable type, was born about 1400 in Mainz (Mayence), Germany. His proper name was Gensfleisch or Gansfleisch, which means Gooseflesh. In 1434 he lived in Strassburg, teaching stonecutting, mirror-polishing and other similar arts. Between 1444 and 1448 he returned to Mainz, where, in 1449 or 1450, he entered into a partnership with Johannes Faust, who furnished the money to set up a printing-press. This partnership was dissolved in 1455 by Faust bringing a suit against Gutenberg to recover money advanced, and Faust gained control of the press. Gutenberg however, assisted by Dr. Homery, set up another press, at which he wrought until his death in 1468. A bronze monument, the work of Thorwaldsen, has been erected to his memory at Mainz. There are a few copies preserved of books printed by him, which bring enormous prices. See *Memoirs of Celebrated Characters* by Lamartine.

Guth'rie, Okla., a town (founded in 1889), is the capital of Logan County, Oklahoma, situated on the Cimarron River, and on the Atchison, Topeka and Santa Fé and 'Frisco railroads. It is the center of a fine grazing-country, which also produces grains, potatoes, broom-corn etc. Though but recently converted from the prairie, and in 1890 having a population of only 5,333, it now is a city of 11,654 inhabitants. It contains several saw, flour and planing mills, carriage and furniture factories, cotton-gins, cottonseed-oil mills and railroad repair-shops. Besides excellent public schools, it has a $50,000 county high-school, St. Joseph's Academy and the Capitol University.

Gut'ta-Per'cha. See INDIA-RUBBER.

Guyot (*gē'yō'*), **Arnold,** a geographer, was born in Switzerland in 1807, took his degree in Berlin in 1835, was the colleague of Agassiz at Neuchâtel during 1839–48, and in that year came to America with him. A course of lectures delivered by Guyot at Lowell Institute, Boston, was translated and published under the title of *Earth and Man* in 1853. He was appointed professor of physical geography and geology at Princeton in 1854, and manager of the meteorological department of Smithsonian Institute, where he delivered courses of lectures, publishing in connection therewith *Meteorological and Physical Tables* and a *Treatise on Physical Geography.* From 1874 to 1877 he was joint-editor of *Johnson's Cyclopedia.* Guyot died at Princeton, N. J., Feb. 8, 1884.

Gwalior (*gwä'lē-ôr*), the capital of a state of the same name in central India, is built on a rock 300 yards wide by one and a half miles long and 340 feet in height, forming a citadel that is almost impregnable. At the base lies the old city, containing little but a beautiful old white mausoleum or vault for the dead. To the southwest the new town of Lashkor extends, and four miles to the northeast is Morar, the British cantonment. Gwalior has two beautiful Hindu temples and one of the most interesting specimens of palace-building in India. Population 118,000. Gwalior, the state, one of the central native states in British India, has an area of 25,041 square miles, with a population of 3,090,798.

Gymna'sium and **Gymnas'tics.** The word gymnasium, from a Greek word meaning naked, was applied to the public places where the Greek youths took exercise. They were fitted with running-paths, wrestling-rings, baths and halls. They were a great resort for teachers and philosophers, and possibly from this the higher German school, which corresponds to the grammar-school grade in public schools, is called a gymnasium. Gymnastics, from the original meaning of the word, might be supposed to include all classes of athletic exercise; but, strictly speaking, gynmastics, as now used, means only indoor exercise and the strengthening of the muscles of the body. These exercises and games are so old as to be almost prehistoric, being alluded to in the *Iliad.* They were part of the course of education, and were made up of running, leaping, dancing, wrestling, boxing, hurling, etc. But they gradually fell into disuse, only to be revived by the Germans in 1774 and 1784, and they have been in great use ever since. Gymnastics may be divided into two classes, one with apparatus and the other without apparatus. The latter has been especially studied in Sweden, where it consists of various movements of the arms, trunk and legs, alone or together. The next in simplicity is exercise with movable apparatus, such as dumb-bells and Indian clubs. Then come the horizontal bar, the parallel bars, the rings, trapeze-bar, climbing-poles and ropes and weights and pulleys. The value of gymnastic exercise cannot be computed, inasmuch as it strengthens and builds up every part of the frame. Beginners, however, should be careful to take their training under the guidance of a proper instructor.

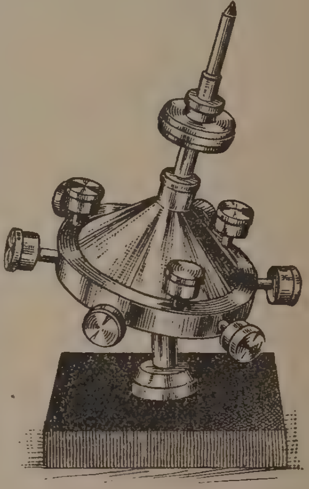
Gym′nosperms, one of the two great divisions of seed-plants (*Spermatophytes*). The most familiar gymnosperms in temperate regions are the pines, spruces, cedars etc., plants which are commonly called evergreens. About 400 species of gymnosperms exist to-day, and are a remnant of a former, much larger display. The common pine may be taken as a type, and its principal structures will serve to represent those of the whole group. The plant-body consists of a central shaft which extends to the very top, with lateral branches spreading horizontally in diminishing length to the top, forming a conical outline. This body is clothed rather densely, particularly at the extremities of the branches, with characteristic needle-leaves. These leaves are poorly adapted for leaf-work, but are well adapted for enduring hard conditions. The stamens and carpels are borne in separate clusters, which are known as cones or *strobili*. In the ordinary forms the staminate and carpellate cones are on the same tree. The staminate cones are very small and attract little or no attention. The carpellate or pistillate cones, on the contrary, become very large and conspicuous, developing in size and changing in structure as the seed matures, until sometimes they become very large, the scales being hard and even bony. If one of the carpellate cones be examined, it will be found that near the base of each of the hard scales there is a pair of seeds. It is the fact that these seeds are exposed, rather than inclosed, which gives the name gymnosperm to the group, meaning naked seeds, as opposed to angiosperms, which means seeds inclosed. Among gymnosperms the pollen is transported from the stamens to the ovule-bearing cones by means of the wind. This habit of wind-pollination demands the development of pollen in great quantity and of a very dry, powdery character. In the true pines each pollen-grain has two wings to aid in this wind-pollination. So abundant is this pollen that sometimes it descends in showers, covering the surface of the ground over large areas with a deposit of yellowish material which is often taken for a "shower of sulphur" by the uninitiated, and probably is referred to by local newspapers under that head. If a wind, during the pollinating season, happens to be very strong, these showers of pollen may descend in regions far distant from the pine-forest. Four living groups of gymnosperms are recognized: (1) Conifers, represented by the ordinary pines, spruces, hemlocks etc. of temperate regions; (2) Cycads, fern-like gymnosperms, restricted entirely to the tropics; (3) Ginkgo, the ordinary maiden-hair tree, chiefly existing at the present time in cultivation; and (4) Gnetums, a curious group of widely-scattered plants growing in the deserts and the tropics. In addition to these four living groups no less than two extinct ones have been made out from their fossil forms, one of the largest groups existing during the coal measures and having become extinct at that time. See Conifer, Cycad and Ginkgo. John M. Coulter.

Gypsies (*jĭp′sĭz*), are a wandering race of people found all over the world, being peculiar alike in their looks, language and manner of living. How they got the name of gypsy or where they originally came from is not known. That they are from the east is generally admitted; but as to the probable antiquity of the *Rómani*, as they call themselves, the ablest scholars are divided. As a race they are good-looking, with a tawny, olive skin; a dark, lustrous eye; very white teeth; black or dark-brown hair, rather coarse and frizzled; a graceful form; and finely-made hands and feet. These bodily peculiarities are as marked as are those of the Jewish people. In character, also, they seem to stand apart and alone. The better kind are quick-witted, courteous and trustworthy —when trusted; lavishly generous with one hand, while they grasp a bargain with the other. Having no ambition and leading a kind of cuckoo-like life, their aim seems to be to make the best of this life, as they find it, thinking little and caring less for the future. Their piety, when they assume any, is largely cant, and the faults of these 'spoiled children of nature" are very similar to those of our native American Indian — boastful, crafty, superstitious, thriftless and indolent — with a passionate streak added. They break most of the ten commandments — but lightly — great crimes being rare among them. Their specialties of horse-dealing and fortune-telling favor easy ideas of right and wrong; while their views on what is mine or thine are decidedly loose. They excel as tinkers and blacksmiths. Their language is a bond of universal brotherhood, for gypsies everywhere speak the same Rómani or gypsy-tongue.

In Turkey, as also in England, Finland and Italy, the gypsy calls himself "rom" (man or husband), from which come "romni" (female gypsy — woman or wife) and the adjective "rómano" (gypsy). This may account for the supposed Egyptian origin of the race, the ancient Egyptian "rôme" being man. They were traced as late as 1417 from the east through Germany, Switzerland, Italy and France; while in 1447 they reached Spain; Poland and Russia about 1501; Sweden in 1512; and England in 1514. They have been protected by kings, popes and nobles; Emperor Sigismund, Pope Martin V, an Earl of Surrey, James IV and Archduke Joseph of Austria being among the number of their friends. They have also been persecuted in many countries, charged with kidnapping children and acting as spies. They number in Europe about 700,000. Asia has thousands of them, and they are constantly emigrating to the United States and Australia. See Borrows' *Rómany-Rye.*

Gyp′sum. Gypsum is a mineral composed of lime sulphate in combination with water. Translucent varieties are known as *selenite,* and very fine grades of the material, of white color and special luster, are known as *alabaster.* When heated, the water of the gypsum escapes and the mineral becomes a white powder. If moistened, this powder "sets." This material is known as plaster of paris, the name being due to the fact that gypsum was early used near Paris for the making of plaster or cement. Plaster is also used as a fertilizer on land. Gypsum occurs in various states of the Union, notably Iowa, Kansas, Michigan, New York, Ohio and Texas. It is also worked to some extent in Arizona, California, Colorado, Montana, Oklahoma, Oregon, South Dakota, Utah, Virginia and Wyoming. The workable beds of gypsum are deposited in salt lakes. As the salt water becomes more and more concentrated, the gypsum is precipitated before the salt. Gypsum is therefore often associated with salt-deposits, but since it is often deposited from water which is not saturated with salt, it is sometimes precipitated from lakes which never deposit salt. Gypsum occurs in many sedimentary rocks in the form of single crystals or in groups of crystals. In some parts of the west, as in parts of New Mexico, the gypsum occurs at the surface, and its fine particles are blown about like sand, making dunes.

Gyroscope (*jī′rō-skōp*), an instrument used to illustrate many of the phenomena which occur in the dynamics of rotation. It consists of a flywheel with a heavy rim, supported in such a way that it may rotate freely about any one of three axes, each at right angles to the other two. The instrument was designed by Bohnenberger (1817) and perfected largely by Foucault (1852) for the purpose of illustrating the various motions of the earth, especially the stability of the axis of rotation, the rate of rotation and the precession of the equinoxes.



MAXWELL'S DYNAMICAL TOP

The theory of the gyroscope is too intricate for our limited space. For an attractive elementary presentation of this subject, see Worthington's *Dynamics of Rotation* or Perry's *Spinning Tops.*

The accompanying figure shows what is perhaps the simplest and most beautiful of gyroscopes, namely, Maxwell's dynamical top. This instrument is supported at its center of gravity, and the three axes about which it may rotate all intersect at this point of support. An ordinary top is merely a gyroscope which is supported below the center of gravity and on a plane.

H

H (*aitch*), the eighth letter, is a quasi consonant formed in the same place as the vowel following. It is best known as the rough breathing, and differs in many respects from other breath-sounds. Abruptness is what most distinguishes it. It is silent in a few words, as *hour*, and is often dropped by uneducated English people. It is used with some consonants to form digraphs not in the alphabet, as *sh* or *th*. With others, as *c* or *p*, it is used to modify their sounds, as in *charm* or *phantom*. In some words *h* after *c* or *g* causes them to remain hard before *e*, *i* or *y*, as in *chemistry*, *Ghibelline*, *chyle*. Its form is that of the Greek *eta*.

HAAKON VII.

Haakon VII, king of Norway, was born at Copenhagen on Aug. 3, 1872, and became king on Nov. 20, 1905. He is a grandson of the late King Christian IX of Denmark and the second son of King Frederick VII. He was educated in the Danish public schools and at the naval academy. He served as a lieutenant in the national navy, and on July 22, 1896, married Princess Maud Alexandra, the youngest daughter of Edward VII of England. In 1905 he was asked to become a candidate for the Norse throne, accepted through his grandfather and on November 12 and 13th was elected by the people's vote, those who opposed him being in favor of establishing a republic. The national legislature ratified the election on Nov. 18, and the new king landed on the 25th. He has a son, Crown-Prince Olaf, who was born on July 2, 1903.

Haarlem (*här'lem*), the chief city of the province of North Holland, in the Netherlands, is ancient and interesting in many ways. It is intersected by an extensive system of canals, which bring the shipping through the streets of the city. The houses are built in the typical Dutch style, having gable ends and old-fashioned crow steps. Objects of interest are the old market, built in the 16th century, and the cathedral of St. Bavo, one of the most famous churches in the Netherlands. It was built in 1538, is 426 feet in length, and has a tower 253 feet in height. Haarlem is the seat of several noted scientific, theological and benevolent institutions. In the 15th century the city was famous for its cloth-weaving and brewing, containing in 1594 no less than 120 breweries. Later the weaving of silk, lace and damask was introduced by the French, and gave employment to 10,000 of the population. At the close of the 18th century these industries had greatly declined, and the population was reduced. Early in the 19th century Haarlem began to turn its attention to new lines of manufacture, and has greatly prospered. Population 70,299.

Habak'kuk, one of the twelve minor prophets of the Old Testament. He prophesied near the close of the 7th century B. C. His personal history is unknown. In his book he appears as a prophet of Judah, announcing the divine punishment which is to come upon his native land at the hands of Nebuchadrezzar, and his aim was to lead his people to trust in the God of Israel. Both as a poem and as a prophecy his book holds high rank among the Old Testament Scriptures.

Hab'berton, John, an American author and journalist, was born at Brooklyn, N. Y., Feb. 24, 1842. He was educated in the public schools of Illinois, his family having moved to that state. He served in the army during the Civil War, became literary editor of the *Christian Union* in 1873, and later was literary critic on the staff of the New York *Herald*. In 1876 he published *Selections from the Spectator* and *Helen's Babies*, a humorous sketch which attracted immediate attention and reached an immense sale. Since that date he has written many books belonging to the field of light literature,—*The Jericho Road*, *The Barton Experiment*, *Some Folks*, *When Boys were Men* etc.

Ha'beas Cor'pus (meaning "have the body"), the writ served upon a sheriff or person having charge of a prisoner, commanding him to produce the body of the prisoner in court before the judge issuing the writ, at a specified time, and to state the cause why the prisoner is detained. The *Habeas Corpus* Act was passed in the reign of Charles II, 1679. Previous to this time it had been possible for those high in authority effectually to rid themselves of their opponents for long periods of time by having them imprisoned upon some charge, and the Habeas Corpus Act was passed to prevent this abuse of authority by illegitimate detention of persons in prison without a trial. The United State law is practically the same as the English, having been copied from it.

Hab′it. By habit is meant a method of responding to certain stimuli that has been learned or acquired by its possessor. Habit is thus distinguished from instinct, in that the latter is inherited. Both depend upon association (see ASSOCIATION OF IDEAS) or pathways of discharge that exist between sensory and motor centers in the nervous system. The reflex actions and the instincts depend on hereditary associations existing largely in the spinal cord and in the ganglionic masses at the base of the brain, whereas habits depend upon associations established in the cortex of the cerebrum as a result of experience. In the human being bodily control is much more dependent upon habitual coördinations than in any of the lower animals. Hence the helplessness of infants before habits have had time to form.

The method by which habits are established may be roughly indicated in the following example. Speech is a habit dependent in general upon the formation of associations between the auditory lobes lying in the temporal regions of the brain and the motor-areas controlling the vocal organs, which lie more toward the front. One hears a sound, and in the endeavor to make it produces a sound more or less like the model. The nervous currents have discharged in a random way from the auditory into the motor-regions. The reaction is an experiment that is repeated or not, according as its result approximated to the desired sound. Experimentation continues until an entirely satisfactory result is gained, when by repetition the effective pathway of discharge is strengthened until it becomes the habitual one. Thereafter the individual will tend unconsciously to respond to the hearing of the sound by making it. Further, the auditory tracts may become associated with other sensory areas, so that, for instance, when one sees a horse, he instantly thinks of the sound of its name and tends to utter it. This utterance may be checked by other impulses tending in other directions. The simple acts governed by single stimuli become themselves coördinated into complex acts by the association of their stimuli. A simple suggestion may thus start off a complicated series of actions, as in walking, speech, playing the piano etc. Here the sensation of having done one act constitutes part or all of the stimbus for the next.

Habit is indispensable to practical efficiency. Through it action is simplified by the elimination of useless movements. This insures accuracy and rapidity of reaction to a situation. It also gets rid of much of the fatigue involved in experimental activity. Most important of all, consciousness is relieved from the strain of a tive superintendence over habitual acts. This permits it to attend to new matters. Every useful habit formed is so much gain toward larger achievements. On the other hand, every useless or injurious habit is a positive check to such advance. Worse: when the habit is formed the mind finds it difficult or impossible to take charge again of the reaction in order to remedy it. We are thinking of other things, and have acted in the habitual way before we can check ourselves. Usually only such constant watchfulness as seriously impairs our efficiency in other fields will avail. Professor Bain gives the following rules for breaking old habits or forming new ones: first "launch yourself with as strong and decided an initiative as possible;" and, second, "never suffer an exception to occur until the new habit is thoroughly rooted in your life."

Habit does much toward making the man, the social order and the race what they are. It is, as Professor James declares, the great conservative force in society. When one has fixed his habits of life, he has practically determined what he shall be. He may change in this or that detail, but the mass of characteristics can not be modified. At 20, Professor James thinks, our personal habits, such as those of speech, manners, dress etc. are practically formed, and by 30 our intellectual and professional habits are well-established. The question of generalized habits is discussed under MENTAL DISCIPLINE. See ASSOCIATION OF IDEAS, CHILD-STUDY, PSYCHOLOGY FOR TEACHERS. Consult *Principles of Psychology* by James.

Hack′ensack, city and county-seat of Bergen County, New Jersey, on Hackensack River, 16 miles from New York. It is a residential city, but manufactures silk, jewelry, wallpaper, brick and other things. It has a high school, a public library and all the adjuncts of a modern city. It has electric connection with New York and other nearby cities, and is served by the New York, S. & W. and Erie railways. It was settled about 1640 by the Dutch. Population 14,050.

Had′dock, an important food-fish of the North Atlantic, resembling the cod in habits and appearance and belonging to the same family. The haddock is, however, to be readily distinguished from the cod by having a black lateral line on each side of the body, while that of the cod is white. The haddock does not reach the size of the largest cod; the average size caught weigh from three to four pounds, and the largest ones do not weigh over 17 pounds. They are found on the codfishing grounds, but are more limited in their range; swimming in large schools, they are more bunched together. Their eggs are very numerous, as is also the case with the cod; it has been estimated that there are nearly two million eggs in a single fish weighing ten pounds.

ARTHUR T. HADLEY

Had'ley, Arthur Twining, American economist and president of Yale University, was born at New Haven, Conn., April 23, 1856, and educated at Yale, from which he graduated in 1876. He subsequently passed two years at the University of Berlin, studying history and political and economic science. Returning to the United States, he became tutor and lecturer at Yale, being at the same time interested in labor-problems and in the science of railroad-transportation, on which he became an authority. In 1899, being at the time professor of political science in the graduate department of Yale, he was elected president of the University. He also became president of the American Economists' Association, and, in addition to a series of articles on transportation in Lalor's *Cyclopædia of Political Science*, he has published *Railway Transportation; Economics;* and a history of Yale in *Four American Universities.*

Ha'drian, Publius Ælius Hadrianus, Roman emperor from 117 to 138 A. D. He was born at Rome in 76 A. D., and in early life was under the patronage of Trajan, who was his kinsman. He filled several high offices in the state, and served with distinction in both the Dacian campaigns; and on the return of Trajan to Italy was left as prefect of Syria and commander of the legions which had conquered the Parthian empire. Trajan having died in Cilicia on his journey home, Hadrian was proclaimed emperor by the army. The empire was in a critical state. There were insurrections in Egypt, Palestine and Syria, the warlike Parthians had again asserted their independence, while the provinces were suffering from barbarian attacks. Hadrian wisely decided upon a policy of conciliation. He surrendered to the Parthians all the country beyond the Euphrates, appeased the barbarians who had invaded the frontier provinces, strengthened himself at Rome by lightening the burdens of the people, while he punished with severity a conspiracy of certain nobles against his life. In 119 he left Rome and made a tour of the empire for the purpose of learning the needs of all the provinces. He is said to have made this journey chiefly on foot, marching bareheaded, often 20 miles a day, and cheerfully sharing the hard fare of the humblest soldier. He visited Gaul, Germany and Britain, where he built the famous wall from the Solway to the Tyne. Returning, he visited Spain, Egypt, Asia Minor and Greece, reaching Rome after his circuit of the empire in 126 or 127 A. D. Later, he again visited the eastern provinces, spending two years in Athens, which he adorned with splendid and costly buildings. After crushing a great rebellion of the Jews, which broke out in 131 and lasted for several years, he returned to Italy and lived at Rome. During the painful illness of which he died in 138, he was guilty of violent outbursts of cruelty, which cast a shadow on the luster of his early reign.

Hæckel (*hăk'ĕl*), **Ernst Heinrich,** one of the ablest German naturalists, was born at Potsdam, Feb. 16, 1834. He studied medicine and allied sciences at Würzburg, Berlin and Vienna, and in 1865 became professor of zoology at the University of Jena, a position he has held ever since. He has traveled extensively, made many original investigations and written important works in zoology and other subjects. He is the most aggressive representative of the evolutionary ideas as to man's origin. With less poise and more impulsiveness than Huxley, he has been the popular exponent in Germany, as Huxley was in England, of biological discoveries. His *Riddle of the Universe*, *Monism* and *The Last Link* represent his point of view on many subjects of deep interest. Among his best-known works are *The History of Creation* and *Evolution of Man.* Hæckel founded the gastræa theory, to the effect that the common ancestor of higher animals was a gastrula or animal whose body consists of a two-cell-layered sac, the opening being the mouth and the interior the stomach. His other important works are *Origin and Development of the Human Race; General Morphology; A Visit to Ceylon; Confessions of Faith of a Man of Science;* and several monographs on insect, shell and other minute life.

Hafiz (*hä'fiz*), **Mohammed Shamsuddin** or **Shems-ed-Din** (*i. e.*, Son of the Faith), better known by his poetical name of Hafiz, is conceded to be the greatest of Persian lyrical poets. He was also eminent as a teacher of theology and mystic philosophy, but it was his poetic genius which gained for him a world-wide fame. The date of his birth is unknown, but he is said to have died at a ripe old age in 1388 A. D. See English translations of some of the *Odes* by Love, Bichnell and Robinson.

Ha'gar, Stansbury, a distinguished ethnologist and an authority upon Peruvian astronomy, was born in 1869 in San Francisco. He graduated in 1892 from Yale and in 1897 from New York, University. He is a member of many scientific societies.

Ha'gerstown, Md., the capital of Washington County, twenty miles north of Harper's Ferry, in the northwestern part of Maryland. It is situated on Antietam Creek, in the Cumberland Valley, and several railroads pass through the town. It is an old and well-settled region, peopled to some extent by well-to-do Germans or by those of German descent. It has a number of fine public buildings, including a free public library and an academy of music. Its industries embrace the manufacture of flour, furniture, cigars, fertilizers, machinery and agricultural implements. Population 16,507.

HENRY RIDER HAGGARD

Hag'gard Henry Rider, an English novelist of note, was born June 22, 1856, at Bradenham Hall, Norfolk. He was educated at Ipswich, and in 1875 went as private secretary of Sir Henry Bulwer to Natal, South Africa. Later, he was private secretary to Sir T. Shepstone, commissioner to the Transvaal, and still later was made master of the high court of the Transvaal. In 1879 he returned to England and began his literary career. In 1882 *Cetewayo and His White Neighbors* was published, and in 1884 his first novel, *Dawn*, appeared, and *The Witch's Head* in 1885. The publication of *King Solomon's Mines*, 1886, gave him wide celebrity, and this was followed by *She* and *Jess* in 1887. Among his later novels may be mentioned *Allan Quatermain*, *Cleopatra*, *Ayesha* and *The Heart of the World*. He was, while he followed his peculiar vein, regarded as a master of the weird and fantastic in fiction. Of recent years he has taken a deep interest in all rural problems, and has written *Rural England*, a standard work upon English agriculture, and *The Poor and the Land*. In 1905 he visited the United States, as a British government commissioner, for the purpose of investigating the problems of land-settlement and labor-colonies. He is a member of the royal commission on coast erosion.

Ha'ggart, Hon. John G.—born in Perth, Ontario, 1836. Elected to the House of Commons in 1872 and re-elected at each election since. Became postmaster-general in the Macdonald government in 1888. Became minister of railways in 1892 in the Abbott ministry. Held the same portfolio in the Thompson, Bowell and Tupper administrations. Resigned in 1896. Still a member of the House of Commons.

Hague (*hāg*) **Peace Conference,** a body of delegates or representatives of the various civilized nations who met at The Hague, Holland, to consider the subject of the promotion of international peace. The conference was called at the suggestion of the emperor of Russia, and met in May, 1899. Twenty-six of the states of the world were represented. Baron de Staël of Russia was made president. The idea and purpose of the conference were new. The sessions were secret, and no authentic account of the proceedings has ever been given. Much was expected of it by the philanthropists of the world, but the results were disappointing, since the conference seemed, by the light of later events, but the signal for the beginning of a series of wars. Russia's proposals for compulsory arbitration and the reduction of existing armaments were not adopted. England and the United States were mainly together in the scheme of arbitration finally adopted, which was voluntary in its plan. On the whole the Hague Peace Conference was not immediately productive of results beyond its significance as an evidence of the willingness of the nations to discuss together the subject of an universal peace. The delegates from the United States were Andrew D. White, ambassador to Germany; Stanford Newel, minister to the Netherlands; Capt. William Crozier, U. S. army; Capt. A. T. Mahan (retired), U. S. navy; President Seth Low, Columbia University; F. W. Holls, of New York, secretary of the delegation. A permanent court of arbitration was agreed upon, the members of the same to be appointed by the various governments interested.

A second peace conference was held at The Hague, June 15 to Oct. 19, 1907, at which forty-six powers, including Latin America and Norway, were represented by delegates. As in the case of the first conference, not all that was hoped for was accomplished, The establishment of obligatory arbitration and a standing court of arbitral justice, which were urged by thirty-nine nations, including England, France and the United States, failed through the opposition of Germany, backed by Austria, Italy and a few others. The most important results accomplished were the establishment of a prize-court; the extension of the provisions of the Geneva convention to war at sea; the prohibition of the collection of public debts by force until after arbitration shall have been refused or an arbitral reward set at naught; regulations concerning bombardments and submarine mines; and a declaration in favor of arbitration.

Hague, The, the official capital of the Netherlands, situated in the province of South Holland. It lies within three miles of the North Sea and about 34 southwest of Amsterdam. It is the handsomest, most fashionable and most modern-looking city in the Netherlands, and has been described as half-Dutch and half-French. It is the seat of the government, of both chambers of the states-general and of other tribunals and public offices, in one of which the state-papers have been preserved for four hundred years. The most important public institutions are the royal library, with over 200,000 volumes; the picture-gallery, with a splendid collection of works by native painters; the town-museum of antiquities and modern art; the royal school of design and music; the town-hall; and the royal palaces. It was here, in 1899 and 1907, that the Czar's International Peace Conferences met. Population 270,109.

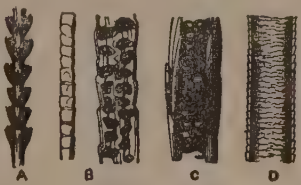
Hahnemann (*hä'ne-män*), **Christian Friedrich Samuel,** the founder of the homœopathic school of medicine, was born at Meissen, in Saxony, April 10, 1755. He studied in the Electors' School at Meissen and afterward at the universities at Leipsic and Vienna. After practicing as a physician for two years, he entered the university at Erlangen, from which he graduated in 1779. After practicing medicine for ten years, he returned to Leipsic in 1789 and devoted himself to chemical research and the translation of medical books. While working on Cullen's *Materia Medica*, he was struck by the unsatisfactory explanation given of the properties of Peruvian bark. He took repeated doses of the bark, in order to find out what kind of action it had on persons in health. After much study and many experiments he became convinced that the cure for a disease is the very drug which would in a healthy person produce symptoms of such a disease. Further experiments convinced him that the usual doses produced symptoms much too violent, and this led him to consider another principle — that of small doses. Fully convinced of the truth of these principles, Hahnemann spent the remainder of his life in making them known to mankind. He met with great opposition, both from physicians and druggists, and finally, in 1821, was driven from Leipsic under a Grman law forbidding a physician to dispense his own medicine. He went to Köthen, where he resided and practiced under the protection of the Duke of Anhalt-Köthen until 1835, when he removed to Paris, where he died July 2, 1843.

Hail, globules of ice of various sizes, which fall in the atmosphere after the manner of rain. The phenomenon is observed only in hot weather and generally during the daytime. Hail-storms last seldom more than a few minutes. If a hail-stone be cut in two, it will be found to be built up mostly of concentric layers of ice. The explanation of this structure and of hail-storms in general is imperfectly understood; but it appears highly probable that they are brought about by a cyclone or tornado having an axis parallel to the surface of the earth. The motion of the atmosphere about this axis may be so rapid as to carry raindrops from the lower and warmer to the upper and colder regions. In the higher regions the water becomes frozen, and at every round trip takes on a new coat of ice, thus accounting for the concentric layers.

Hail Columbia. Popular American national song. Words by Judge Hopkinson to a tune known as *The President's March.* The authorship of this march has been claimed for Pfyles, the leader of a theater orchestra, and for a German musician by the name of Johannes Roth. The march was played for the first time as Washington rode over Trenton Bridge on his way to be inaugurated. It soon became popular, and, in John Adams' presidency, at a period of great political excitement, was wedded to the words of Judge Hopkinson. The followers of Jefferson and Madison naturally derided the song, which nevertheless became a national song, regarded as one of the most stirring of its class. The crudities of the earliest version have largely disappeared in the one now in common use.

Hai'leybury. An important town on the shore of Lake Temiskaming and on the line of the Temiskaming Railway. In the midst of a rich mining-district, and adjacent to a first-class agricultural settlement. See TEMISKAMING.

Hair, a growth from the outer layer of cells in mammals affording a protection and known as fur, hair etc. It corresponds to feathers and scales, and may form a dense covering for the entire body, except the soles of the fore and hind feet, or may be confined to special regions. Hair grows sparsely on nearly all parts of the human body except the palms and soles. Hair grows from a tubular pocket or follicle which is produced by a sinking-in of the skin. At the bottom of the pouch is a rounded heap or cluster of cells containing a knot of blood-vessels; this is called the hair-papilla, and from it the hair grows and is nourished. The follicle is provided with oil-glands that keep the hair soft.



HAIRS OF VARIOUS ANIMALS MAGNIFIED

(a)Indian bat; (b)mouse; (c)sable; (d) human

The hairs are flexible, horny threads; the part which projects beyond the surface of the skin is called the shaft; the portion imbedded within the skin is the root, which at its lower extremity is expanded into a hollow knob called the hair-bulb; this fits over the hair-papilla. The hairs are inserted obliquely into the skin and the follicles are connected with small muscles, also obliquely placed, the contraction of which under the influence of cold, fear or other causes raises the hair. The shaft is composed of an outer layer, a middle layer of modified cells and a central core with minute air-cavities. As the hair grows from the bulb, the outer cells lose their protoplasm and become flattened scales; under the microscope the hair shows wavy lines where these scale-like remnants of cells fit together. The individual hairs have a certain length of life, and are shed and replaced. The human hair is not shed periodically, but a constant shedding and replacement is going on as regards hairs of the scalp and the beard. The color of hair is due to coloring matter or pigment, and is modified by the air-vesicles contained within the shaft. The cut end of straight hair is circular in outline and that of curly hair is elliptical. Different kinds of hair can be distinguished both by texture and by microscopic examination. The hairs of the sloth, mink, seal, sheep or goat have each a different feel and a different appearance under the microscope. The causes of loss of hair or baldness are various and imperfectly understood; it is supposed to be due to contraction of the mouth of the hair-follicle and insufficient nutrition to the hair; these conditions are doubtless influenced by the presence of bacteria. The theory of hair-restoration is to remove the bacteria, expand the mouth of the hair follicle and stimulate the hair-papilla to new growth.

Hairs (in plants), outgrowths from the epidermis. A hair may consist of a single elongated cell or of numerous cells, sometimes branching profusely, as in the common mullein. Sometimes it ends in a knob, consisting of a single cell or a group of cells called a gland, which has the power of excreting a sticky substance, giving the plant a clammy feeling. Such gland-bearing hairs are called glandular hairs and are possessed by many plants. The hairy coverings of plants serve a variety of purposes, helping them to resist cold, drouth, intense sunlight, undue wetting etc.

Ha'kla. See HECLA.

Haiti (*hā-tĭ*) or **Hayti** (mountainous country), called by Columbus Hispaniola, formerly a French colony but now an independent republic, occupies the western portion of the island of San Domingo, between Cuba and Porto Rico, which, next to Cuba, is the largest of the West Indian islands. The area of the republic is about 10,204 square miles, with a population of a little over two millions, chiefly negroes and mulattoes. The island is traversed by many ranges, but the valleys are green and fertile. There are no active volcanoes on the island, but earthquakes are frequent.

Government and Exports. The republic has a president at its head, and a senate, house of representatives and four heads of departments. Its exports are mainly coffee, cocoa, logwood, mahogany and cotton; of its imports about two thirds come from the United States.

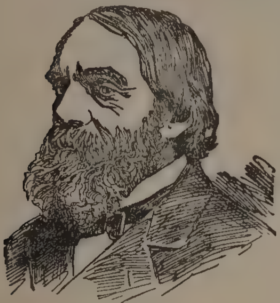
Cities. The capital, Port-au-Prince, has a population of about 100,000 mostly colored. The other towns and their populations are Cape Haitien (30,000), Les Cayes (12,000), Gonaives (13,000) and Port de Paix (about 10,000). The language of the people is mostly a debased (Creole) French, the religion being chiefly Roman Catholicism.

History. Haiti was discovered by Columbus in 1492. A few years after the discovery of the island, its inhabitants were wiped out by the cruelties of the Spaniards, and their places filled by negro slaves as early as 1505. Then the settlement of the buccaneers on the island of Tortugas caused the western part to be ceded to France in 1697. In 1797 began the internal wars between the whites, blacks and mixed races, besides the revolt against France and French rule. Touissaint L' Ouverture, a negro who until he was 40 years old had been a slave, was the hero of the struggle and proved himself a statesman. In 1801 France attempted to regain Haiti, but in 1804 Dessalines proclaimed himself emperor of Hayti. In 1825 the Dominican republic, formed by the union of French and Spanish Haiti, was recognized by France. General Hippolyte became president in 1889, who has since been succeeded by General Tiresias Simon Sam (elected 1896) and later by General Nord Alexis. Several lines of steamers (German, French and Dutch), connect the ports of Haiti with New York and with Hamburg and other European ports. There is a railway from Cape Haiti to Grande River (15 miles), whence a line is to be constructed to Port-au-Prince. From this port is another line to Lake Assuei, which is 28 miles in length and is to connect the capitals of Haiti and the Dominican Republic. See SANTO DOMINGO and *Hayti or the Black Republic* by St. John.

Hakluyt (*hăk'lo͝ot*), **Richard,** a distinguished English geographer, born about 1553 and died 1616. He was educated at Oxford and there became famous as a lecturer on the science of cosmography. In 1589 he published his great work *The Principal Navigations, Voyages and Discoveries of the English Nation. Made by*

Sea or Land Within the Compass of these 1,500 Years. This work is considered of such lasting value that an edition was published in 1885-90.

Hale, Edward Everett, was born at Boston, Mass., April 3, 1822, graduated at Harvard in 1839, and ordained a Congregational minister in 1842. In 1856 he was called to the South Congregational (Unitarian) Church in Boston. His influence in benevolent movements has been widespread. His book, *Ten Times One Is Ten* (1870) originated in the United States a series of clubs called Lend a Hand, and some with other names, which have branches in Europe, Asia, Africa and the Pacific island. The society of The King's Daughters also owes its beginning to Dr. Hale. The motto of these clubs is: "Look up and not down; look forward and not back; look out and not in; and lend a hand." Dr. Hale has edited religious and other journals, Lingard's *History of England* and original documents from the British state-papers and the British Museum, relating to the founding of Virginia. He was long the chaplain of the United States Senate, His published books, mostly stories, number nearly 50, the best known of which are *The Man without a Country*, *In His Name*, *Ten Times One Is Ten* and *Philip Nolan's Friends;* together with the *Story of Massachusetts*, *Lowell and his Friends* and *Memoirs of a Hundred Years.* His collected works appeared in a series of volumes in 1091. He died June 10, 1909.


EDWARD EVERETT HALE

Hale, John Parker, American statesman, was born at Rochester, N. H., March 31, 1806, and died at Dover, N. H., Nov. 19, 1873. After graduating at Bowdoin College, he studied law and in 1830 was admitted to the bar of his state. In 1842 he was elected to congress, after which he sat in the United States senate from 1847 to 1853 and from 1855 to 1865. In the interval he was candidate of the Free Soil party for the presidency, but was defeated by Pierce. He was a born orator, and possessed no little humor and pathos. From 1865 to 1869 he held the post of United States minister to Spain. In his later years he was affected by paralysis, which for several years before his death impaired his mental and physical faculties.

Hale, Nathan, was an American soldier in the Revolutionary army, who rose to the rank of captain. He was born at Coventry, Conn., June 6, 1755. Having volunteered to penetrate the British lines and procure information for Washington, he was detected and executed as a spy in New York city, Sept. 22, 1776. See *The Two Spies, Nathan Hale and John André*, by Lossing.

Half-Tone, a process by which reproductions of photographs, engravings and wash-drawings are made on copper or zinc plates for printing. A photographic negative of the picture to be reproduced is made through a screen consisting of two glass-plates which have been prepared as follows: Each glass-plate is coated with a prepared varnish, then ruled at an angle of 45° with a diamond-pointed cutter, the parallel lines being of any fineness desired. It is then treated with an acid which eats or etches the exposed lines, which are then filled with an opaque pigment and baked in an oven. The glass is then polished smooth, leaving the clear glass transparent. The two, ruled glass-plates are placed together, so that the lines cross at right angles, and are cemented with Canada balsam. This screen is placed in the camera in front of the sensitive plate, and the image is thus broken into dots and the light and shade of the original are preserved. A sensitized plate — generally of copper — is exposed under the half-tone negative, the plate is then given a cold-water bath, and the parts of the coating not printed on are washed out. The picture remaining upon the plate is hardened by a baking process, and is then etched; the plate is carefully finished and mounted on a wood block type high and is ready for the printing-press.

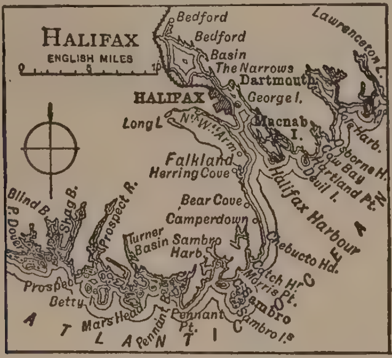
Hal′ibur′ton, Hon. Thomas Chandler (Sam Slick), was born at Windsor, N. S., in December, 1796. He was called to the bar and became chief justice of the court of common pleas of Nova Scotia in 1828 and of the supreme court in 1840, resigning and going to England in 1856, where he died, near Isleworth, Aug. 27, 1867. He is still remembered for his humorous and historical writings, which include *The Clockmaker: or Sayings and Doings of Sam Slick of Slickville*, first series (1837), second series (1838), third series (1840)*; The Attaché: or Sam Slick in England* (1843)*; The Bubbles of Canada* (1839)*; The Old Judge: or Life in a Colony* (1843), in addition to a *History of Nova Scotia.*

Hal′ibut, the largest of the flat fishes and the most important as a food-supply. They are more elongated in form than the other flat fishes and reach a larger size. They are dark above and whitish below. The average full-grown male weighs about 50 pounds, but the female is larger and an average weight is from 100 to 150 pounds. Besides these average sizes, exceptional sizes are recorded running up to six hundred pounds; one weighing 350 pounds is seven or eight feet long and four feet wide. The smaller ones weighing 10 or 20 pounds are called chicken-halibut. They are the best for eating, and bring the highest price per pound. The halibut has about the same geographical range as the cod, but shows a preference for cold water and goes deeper. They are caught at 250 fathoms and deeper. They feed on crabs, mollusks and other fish. Sometimes they pursue fishes to the surface and strike them with their tail before devouring them. See FLATFISH.

HALIBUT

Hal′ifax, a town in the north of England, is situated on the River Hebble, 43 miles southwest of York. Its facilities for transporation, both by water and by leading railroad lines, contribute to its commercial importance. It is noted for its manufacture of worsted goods and carpets. Crossley's carpet-works, the largest in the world, employing 5,000 hands, are situated here. Population 112,818.

Halifax, the capital of Nova Scotia, seat of the government and legislature of the province and the chief Atlantic seaport of Canada, is situated on the eastern coast of Nova Scotia. Its harbor, called by the Indians Chebucto, meaning the greatest of havens, is one of the finest in the world. It was until lately the principal naval and military station of Great Britain in America (now garrisoned by the Canadian government-troops), and is strongly fortified. It also has considerable commercial importance, and is the seat of Dalhousie University and a large number of other educational institutions, including a school for the blind and one for the deaf and dumb. It is the eastern terminus of the Intercolonial Railroad of Canada and the Dominion Atlantic Railroad, and has lines of steamers to Liverpool, New York and Boston. Population 40,832.



Hall, Granville Stanley, educator, psychologist and author, was born in 1846 at Ashfield, Mass. He received the degree of A. B. from Williams College in 1867, A. M in 1870, and was graduated from Union Theological Seminary in 1871. In 1878 he received his Ph. D. degree from Harvard. He has spent several years in study at various universities in Germany. He was professor of philosophy at Antioch College (Ohio), 1872-76, lecturer in English at Harvard and in the history of philosophy at Williams, and professor of psychology and pedagogy in Johns Hopkins University, 1881-88. Since 1889 he has been president of Clark University, Worcester, Mass., and professor of psychology. He is well-known as the editor of the *American Journal of Psychology* and the *Pedagogical Seminary* and as the author of *Adolescence.* He has done much to promote research in psychology, and is recognized as one of America's leading educators.

Hall, Robert, a celebrated English preacher and writer, was born at Arnsby, May 2, 1764. Feeble in body but bright in intellect, he learned to read before he could talk. He was educated at a Baptist academy in Bristol and at King's College, Aberdeen, where his eloquent preaching drew great crowds to hear him. In 1790 he went to Cambridge, where he rose to the highest rank of British pulpit-orators. Besides his published sermons, his more important writings are *An Apology for the Freedom of the Press* and *On Terms of Communion.* See *Life* by Gregory and *Observations on His Preaching* by Foster, in the published edition of his works. He died on Feb. 21, 1831.

Hallam (*hăl′am*), **Henry,** an English historian, was born at Windsor, July 9, 1777. He was educated at Oxford, and read law in Lincoln's Inn, but from the first gave himself entirely to literary pursuits. His first great work, his *View of Europe in the Middle Ages,* was published in 1818. It at once gave him a foremost place among English historians. In 1827 he published *The Constitutional History of England* and in 1837–39 his *Introduction to the Literature of Europe in the Fifteenth, Sixteenth and Seventeenth Centuries.* Upon these three great works rests his position as an historian. He died in 1859. His son, Arthur Henry Hallam, a young man of great promise, who died at 23, is subject of

Tennyson's *In Memoriam.* See *Biographical Sketches* by Martineau, and *Life* in *Remains of Arthur Henry Hallam.*

Halle (*hăl'lă*), a city of Prussian Saxony, is situated on the right bank of the Saale and on several small islands of the river, 20 miles northwest of Leipsic. It is famous for its university, which was founded, in 1694, by Frederick I of Prussia. After having been suppressed by Napoleon in 1806 and in 1813, it was reopened in 1815 and united with the University of Wittenberg. In 1906 it was attended by 2,128 students, and had 165 professors and lecturers. As an important railroad center, Halle has of late years increased rapidly in size and prosperity. It is noted for the production of salt, obtained from salt springs within and near the city, which have been worked from before the 7th century. Population 169,961.

Hal'leck (*hăl'lĕk*), **Fitz-Greene,** an American poet was born at Guilford, Conn., July 8, 1790. By his mother he was descended from John Eliot, "the Apostle of the Indians." He was a bank-clerk in New York, and in 1822 became the private seretary of John Jacob Astor, who left him an annuity on which he retired to his native town in 1849. He began to write at an early age, and in 1819 he contributed, with Joseph Rodman Drake, a series of papers in verse to the New York *Evening Post.* In the same year he published his longest poem, *Fanny*, a satire on the literature, fashions and politics of the time. His famous poem, *Marco Bozzaris*, and the beautiful tribute to Burns appeared in 1822. He published a collection of his poems in 1827 and an enlarged edition in 1845. In 1865 he published his poem, *Young America.* He died on Nov. 19, 1867. His complete *Poetical Writings*, edited by his biographer, appeared in 1869. See his *Life and Letters*, edited by James Grant Wilson.

Halleck, Henry Wager, an American general, was born at Westernville, N. Y., Jan. 16, 1815, and graduated at West Point in 1839. He served in the Mexican War, and was brevetted captain for gallant services in 1847. He became captain of engineers in 1853, left the service in 1854, and for some time practiced law in San Francisco. At the beginning of the Civil War he was commissioned major-general in the regular army, and in November, 1861, was appointed commander of the department of the Missouri. In March, 1862, his command was enlarged so as to embrace the Mississippi valley, and after the battle of Shiloh he took personal command of the army operating against Corinth. In July he was made general-in-chief of all the Federal armies, with headquarters at Washington, from which point he directed the operations of the generals in the field until March, 1864, when he was superseded by General Grant. After the close of the war he commanded the military division of the Pacific until 1869 and that of the South until his death, Jan. 9, 1872. He was the author of *Elements of Military Art* and of books on mining laws.

Hall of Fame, a colonnade 500 feet in length on University Heights in New York City, its full title being the Hall of Fame for Great Americans. It is built to commemorate the greatest citizens of the United States, whose names are here inscribed on bronze tablets. To be eligible to the Hall of Fame, one must have been born a citizen of the United States and have been dead ten years. Nominations are made by the public and are submitted to a committee of 100 eminent citizens. In the case of men 51 votes are required, and in the case of women, 47. In 1900 the following names were chosen and inscribed: George Washington, Abraham Lincoln, Daniel Webster, Benjamin Franklin, Ulysses S. Grant, John Marshall, Thomas Jefferson, Ralph Waldo Emerson, Henry Wadsworth Longfellow, Robert Fulton, Washington Irving, Jonathan Edwards, Samuel F. B. Morse, David Glasgow Farragut, Henry Clay, Nathaniel Hawthorne, George Peabody, Robert E. Lee, Peter Cooper, Eli Whitney, John James Audubon, Horace Mann, Henry Ward Beecher, James Kent, Joseph Story, John Adams, William Ellery Channing, Gilbert Stuart and Asa Gray. In 1905 the following additional names were chosen: John Quincy Adams, James Russell Lowell, William T. Sherman, James Madison, John G. Whittier, Alexander Hamilton, Louis Agassiz, John Paul Jones, Mary Lyon, Emma Willard and Maria Mitchell.

Halloween (*hăl'lō-ēn'*), the eve of All Hallows or festival of All Saints, which, being the 1st of November, Halloween is the night of the 31st of October. In England and Scotland it was long given to fireside gatherings, with many ceremonies by which to discover a future sweetheart. These are referred to in Burns' well-known poem of *Halloween.* In this country it is known chiefly as a time for boyish pranks and practical jokes. See *Book of Days* by Chambers.

Hal'ophytes, plants which grow in salt or alkaline soils. They are found in the vicinity of the seashore, on the margins of salt lakes, about saline springs and on certain arid wastes of the interior which probably were portions of old seabasins. A large area of the last kind is represented by the so-called bad lands of Nebraska and South Dakota. Few plants are able to endure such conditions, the family which has been best able to adapt itself to them being the goosefoot family (*Chenopodiaceæ*), to which belong such weedy plants as the seablight, salt-wort, greasewood etc. Associated with these plants are certain spurges, sedges, grasses etc. Certain well-known families are never represented in halophyte conditions, as nettles, roses, heaths, mosses and lichens. Halophytes are mostly succulent plants, with thick and often translucent leaves. Prominent among halophyte societies are the mangrove swamps, which occur along flat, tropical seacoasts where the waters are quiet, the mangrove being a curious tree which advances slowly out into the water; beech marshes and meadows, with their growth of coarse grasses and sedges and occurring in large areas beyond the reach of ordinary flood tide; salt steppes, often occurring in large areas in the interior of continents, as in the Great Salt Lake basin, where the races of greasewoods etc. largely flourish; and salt and alkaline deserts, where the scanty water is saturated with salts and vegetation reaches its lowest ebb, as in the region of the Dead Sea and in Death Valley in southern California.

Hal′sted, Murat, an American editor and author, born in Butler County, O., Sept. 2, 1829. He was educated at Farmer's College. College Hill, O. In 1853 he became a reporter for the Cincinnati *Commercial*, and in the following year became part owner. In 1856 he became editor-in-chief, and in 1867 was proprietor. The *Commercial* and the *Gazette* were later consolidated, and he became chief editor of the *Commercial-Gazette* in 1882. A Republican in politics, he was a strong and independent editorial writer. In 1890 he became editor of the *Standard-Union*, Brooklyn, and in 1895–96 wrote letters for the press from Cuba. These were later the chief material for *The Story of Cuba*. He died on July 2d, 1908.

Ham′adan′. See ECBATANA.

Hamath (*hā′math*) or **Hamah,** a very ancient city of Syria on the Orontes, 110 miles north of Damascus. The population is about 42,000, and the people make coarse woolen mantles and yarn, trading chiefly with the Bedouins. Hamath was taken by the Assyrians in 854 B. C. and again in 743 B. C. In 639 A. D. it came into the power of the Moslems. In 1812 four stones were discovered there by Burckhardt, bearing inscriptions in an unknown language now believed to be Hittite

Hamburg (*hăm′bûrg*), a free city of Germany, is situated on the Elbe, about 75 miles from the German Ocean. It was founded by Charlemagne in 808. In 1189 Emperor Henry VI granted it a separate judicial system and freedom from customs-dues, and its commercial prosperity began. In 1241 it joined with Lübeck and Bremen in steps which resulted in the Hanseatic League. From that time it increased rapidly in wealth and population, and by purchase increased its territory, including the present harbor of Cuxhaven. It prospered specially during the Thirty Years' War (1618–48).

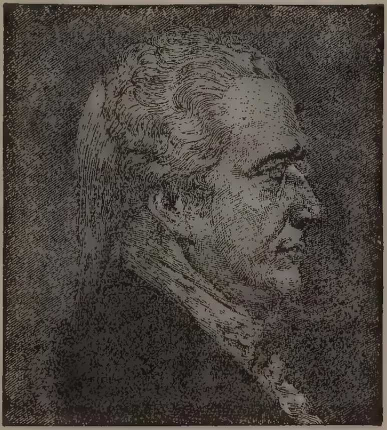
VIEW IN HAMBURG LOWER HARBOR

In 1806 Hamburg was occupied by the French, and this was the beginning of serious reverses. In 1810 it was annexed to the French Empire, and in 1814, when the French occupation ceased, it had lost its commerce and half its population. The next year it joined the German Confederation as one of the four free cities, and its prosperity rapidly revived. In 1842 one third of the city was destroyed by fire, but it was rapidly rebuilt in modern style. Hamburg is the busiest commercial city in Europe and the principal commercial seaport of Germany. Next to London, it has the largest money-exchange transactions in Europe. Hamburg is one of the greatest ports of embarkation for emigrants in Germany. In 1892 it was visited by the cholera, which destroyed thousands of lives and ruined for a time its enormous trade, so that it had to appeal for aid. Population 1,015,707.

Ham′erton, Philip Gilbert, an English writer on art, was born at Laneside in Lancashire, Sept. 10, 1834. He began his career as an art-critic by writing for the *Fine Arts Quarterly* and the *Fortnightly* and *Saturday Reviews.* In 1855 he published a poem on *The Isles of Loch Awe* and in 1862 *A Painter's Camp in the Highlands* and *Thoughts about Art.* From 1869 to 1889 he edited *The Portfolio*, an art-journal. Others of his works are *The Intellectual Life*, *The Graphic Arts*, *Human Intercourse*, *Landscape*, *Portfolio Papers* (1889) and a number of novels. He was a writer of keen discrimination, and had a picturesque and impressive style. He died at Boulogne, Nov. 6, 1894.

PHILIP G. HAMERTON

Hamilcar (*hȧ-mĭl′kär*), a Carthaginian general, the father of Hannibal and one of the greatest generals of ancient times. He was surnamed Barca or Lightning. While still a young man, he was placed in command of the Carthaginian forces in Sicily (247 B. C.), when almost all the island had been taken by the Romans. He seized Ercte, a hill 2,000 feet high, and from this stronghold as a base he ravaged the coast of Italy and for three years, with a small force, defied every effort of the Romans to dislodge him. In 244 B. C. he occupied Mt. Eryx, two miles from the coast, and for two years, with his handful of men, held his own against the Roman army, "fighting," says Polybius, "like a royal eagle, which stops only to gather strength for the next attack." The Carthaginian navy being defeated, 241 B. C., Sicily yielded to Rome, but Hamilcar marched out with all the honors of war. Immediately after peace had been made with Rome, a revolt of the mercenaries and African tribes threatened the overthrow of the state. Hanno, a personal enemy of Hamilcar, undertook to suppress it and failed. Hamilcar was then placed in command and crushed the revolt in 238 B. C. In the same year Rome again made war on Carthage, and Hamilcar was placed in command of the Carthaginian army. He now crossed into Spain, determined there to gather and drill an army capable of meeting the Roman legions, and then wage war on Roman soil. He entered Spain in 237 B. C., and in nine years built up a new empire; but in 228 B. C. he fell fighting the Vetones, leaving the plans of the great Hamilcar to be carried out by his greater son, Hannibal. See *Carthage and the Carthaginians* by Bosworth Smith.


ALEXANDER HAMILTON

Ham′ilton, Alexander, one of the greatest of American statesmen, was born on Jan. 11, 1757, in the West Indian island of Nevis. His father, a Scotch merchant, failed in business, and Alexander, when 12 years of age, entered the employ of a merchant at St. Croix. His marked abilities at the same time] secured him the interest of friends, who sent him to a school at Elizabeth, N. J., and in 1774 he entered King's (now Columbia) College, New York. While at college and but 18 years old, he wrote a series of papers in defense of the colonies which were at first credited to the eminent statesman, John Jay, and at once brought him to the notice of the public. When the War of the Revolution began, Hamilton was made a captain of artillery, and in 1777 was appointed aid-de-camp by Washington and became his valued friend and adviser. In 1780 he married a daughter of General Schuyler. At the close of the war he studied law, and soon became one of the most eminent lawyers of New York. He was elected to Congress in 1782, and in 1787 was a leader in the convention at Philadelphia which framed the constitution of the United States. In October of the same year he began a series of articles explaining the scope and power of the constitution, which were published under the name of *The Federalist.* Of the 85 essays in the collection, 51 were written by Hamilton, and these deservedly gave him his widest fame. When Washington became president of the new government in 1789, he appointed Hamilton secretary of the treasury. Here his able management, which raised the public credit from utter prostration to the highest point, gained for him the reputation of a great financier. In 1795 he resigned his office, but later was active in politics as a leader of the Federal party. In 1804, through a political difference, he was involved in a duel with Aaron Burr, in which he was mortally wounded, July 11, and died the next day. See *Lives* by Morse and by Lodge.

Hamilton, Gail. See DODGE, MARY ABIGAIL.

Hamilton, O., the county-seat of Butler County, is built on both sides of the Miami River. The city owns and operates its own gas and water works. It has thriving factories, which are operated by a system of hydraulics fed by the river, which is turned from its channel into an immense reservoir, while waterpower is also obtained from the canal. Many of these factories have been established in the past few years, and they produce paper, flour, woolen goods, agricultural implements, machinery, tools and iron. Four railroads connect the city with all parts of the country. The public schools occupy fine buildings and take high rank. Population 35,279.

Hamilton, a city of Ontario, Canada, at the western end of Lake Ontario. It is handsomely situated, the residences extending up the slope of "The Mountain," at the foot of which the business portion lies. The streets are wide and shaded with trees, many of the houses and public buildings being among the finest in Canada. It is an important railroad-center, stands at the head of lake-navigation, and in manufacturing industries almost excels any other city in Canada. Population about 73,542.

Hamilton, Sir William, a metaphysician, the most acute logician and most learned philosopher of the Scottish school, was born in 1788 at Glasgow, where his father and grandfather in succession held the chairs of anatomy and botany. Having studied with distinction at Glasgow, in 1809 he entered Balliol College, Oxford, where he gained first-class honors. In 1813 he was admitted to the Scottish bar, but never acquired a practice in his profession, his taste lying much more toward the study of philosophy, in which he had already made extensive researches. In 1829 the publication in the *Edinburgh Review* of his celebrated critique of Cousin's system of philosophy gave him a first place among the philosophical writers of the time. This was followed in 1830 by his criticism of the philosophic writings of Dr. Thomas Brown, the colleague of Dugald Stewart. In 1836 he was appointed to the chair of logic and metaphysics in Edinburgh University. Here he gathered about him a number of ardent students, and re-established the fame of the Scottish school of metaphysicians, which had begun to wane. In 1846 he published an annotated edition of the works of Thomas Reid and, in 1854, the first volume of a similar edition of the works of Dugald Stewart. He died suddenly at Edinburgh on May 6, 1856.

Ham'let, the greatest of the tragedies of Shakespeare, generally ranked first among dramas, deals with the ancient Danish story of a mythical or semimythical Prince of Jutland, named Amleth or Hamlet. But Shakespeare has dealt with this story in such a way that the tale is true for all time. "It is we who are Hamlet," said Hazlitt. The story, as told by Shakespeare, opens with Hamlit's vision of the ghost of his father. The ghost reveals to Hamlet what his prophetic soul had already suspected, that his uncle and mother were guilty of the murder of the late king, his father, who now demands vengeance. The tragedy hangs upon the strife within Hamlet's breast between the duty of vengeance thus laid upon him and his natural shrinking from violent action. After an interval of real or feigned madness, probably the latter, Hamlet takes the vengeance which has been forced upon him by the plots against his own life, and himself perishes in the act. The drama is marked by great situations, noble speeches and an unequaled mastery of the workings of the inmost souls of men. The text of the play is chiefly based upon the first folio edition of Shakespeare's collected works (1623) and the quarto edition of 1604. There are evidences that Shakespeare worked upon this drama at intervals during the greater part of his active literary career. Among the most famous passages in *Hamlet* may be mentioned the advice of Polonius to his son and the soliloquy beginning: "To be or not to be, that is the question."

Ham'lin, Hannibal, an American statesman, was born at Paris, Me., Aug. 27, 1809. He was a lawyer of prominence, was speaker of the state legislature in 1837-40, member of congress in 1842-44 and United States senator during 1848-57. Though previously a Democrat, he left his party because he was opposed to the extension of slavery, and was elected governor of Maine by the Republicans in 1857. The same year he resigned, and returned to the senate. In 1860 he was elected vice-president of the United States, serving under Lincoln from 1861 to 1865. He was again a member of the senate during 1869-81, and was minister to Spain in 1881-82. He died at Bangor, Maine, July 4, 1891.

Ham'merfest, a town in the province of Finmark, Norway. On account of its high latitude (70°, 40′, 10″) the sun remains above the horizon from the middle of May till the end of July. It has a considerable amount of trade with Norwegian, Danish. Russian, English and German vessels, exporting codliver oil and salted fish. It is said to be the most northern town in the world.

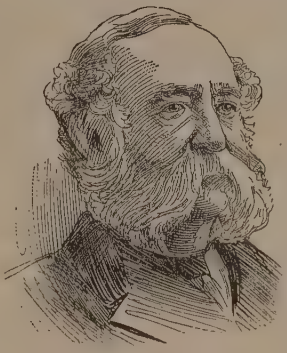
Ham'mond, Ind., a progressive town in Lake County, in the extreme northwestern part of Indiana, close to Lake Michigan and within 20 miles of Chicago. It is situated on the Grand Calumet River, and is served by about a dozen railroad lines. It has a number of good schools and churches, with the adjuncts in electric railways and electric lights of a growing modern city. It is distinctively a manufacturing town, having large establishments, including steel-works, nail-mills, foundries, printing and book-binding, chemical, starch and glue works, carriage and flour mills, a slaughtering and meatpacking plant, a large distillery, brick yards, axle and spring factories etc. Population 20,925.

Hammond, William Alexander, an American physician, was born at Annapolis, Md., Aug. 28, 1828, and died at Washington, D. C., Jan. 5, 1900. He was appointed assistant-surgeon of the United States army in 1849, resigning in 1860 to accept the professorship of anatomy in the University of Maryland at Baltimore. During the Civil War he held the important post of surgeon-general. He was an acknowledged authority in the treatment of nervous diseases. Besides medical works, such as *Military Hygiene*, *Sleep and Its Nervous Derangements*, *Insanity in Its Relations to Crime*, he published several novels — *Robert Severne*, *Dr. Grattan*, *Lal* and *On the Susquehanna*.

Hamp'den, John, English statesman and patriot, was born at London in 1594. He was a Puritan, a relative of Cromwell and one of his strongest and wisest supporters and advisers. He was educated at Magdalen College, Oxford, and entered Parliament in 1621. Here, although no orator, through his judgment, moderation, purity and force of character he took a leading position in the party. He was noted for his opposition to the unjust measures of King Charles, especially for his refusal to pay the ship-money tax. He took a leading part in the memorable Long Parliament, and was one of the five members whose attempted seizure by King Charles on Jan. 4, 1642, precipitated the Civil War. When hostilities began, he joined the parliamentary army, contributed liberally to its support, raised a regiment of infantry and in the struggle that ensued displayed great bravery and generalship. He was mortally wounded at Chalgrove Field, June 18, 1643, and died June 24. Such was his capacity as a statesman and a soldier that Macaulay has said that, if he had lived, he would have been the Washington of England. See *History of the Great Civil War* by Gardiner and *Arrest of the Five Members* by Forster.

Hamp'ton Normal and Agricultural Institute was opened in 1868 as a school for negroes and Indians in Hampton, Va., by the American Missionary Association. It has a large number of buildings, including a library, gymnasium, dormitories, church, trade-school where blacksmithing, carpentry, housepainting and tailoring are taught, a saw and planing mill, domestic science building, various shops etc. In addition to a campus of 185 acres, the Institute has a stockfarm of 600 acres. The curriculum includes courses in mechanical, civil, electrical and mining engineering. The boys are under military discipline. Much of their expense is met by their labor. The annual income of the Institute is about $170,000. During the vacation a summer-school is held which is largely attended by colored teachers from the south, aggregating about 500. The majority of its graduates, of whom Booker T. Washington is the most distinguished, are teachers in southern schools, but many others engage in trade and farming.

Hampton Roads, an arm of Chesapeake Bay on the Virginian coast, forming the entrance of James River. It is defended by Fortress Monroe, which is on the northern shore. Here, on March 8, 1862, the United States war-vessels, *Congress* and *Cumberland*, were sunk in a naval battle with the Confederate ironclad, *Merrimac;* and on the 9th of March the contest between the *Monitor*, the first turreted vessel, and the *Merrimac* took place.


WADE HAMPTON

Hampton, Wade, a distinguished soldier of the Confederacy and a United States senator. He was born at Charleston, S. C., March 28, 1818, the third of the name in a distinguished family. He was educated at South Carolina University, and served in the legislature of the state. Here he opposed secession, but, when the ordinance was passed, entered the Confederate service as a private. During the course of the war he rose to the rank of lieutenant-general, and was in command of the cavalry arm, first in Lee's army and later in Johnston's. In 1878 he was elected governor of South Carolina, and was chosen United States senator from that state in 1879. In 1893 he was appointed United States commissioner of railroads. He died on April 11, 1902.

Han'cock, John, an American statesman, was born at Quincy, Mass., Jan. 12, 1737. He became a prominent merchant in Boston, having received a large fortune from an uncle in whose counting house he had been trained. He was a member of the legislature of Massachusetts in 1766. The attempt to seize his sloop *Liberty* for evading the customs-law caused a riot, and the royal commissioners barely escaped with their lives. An address, delivered at the funeral of the victims of what is known as the Boston Massacre, offended the colonial governor, who attempted to seize Hancock and Samuel Adams; and after the first battle of the Revolution the governor offered pardon to all except these two. He was president of the Continental Congress, and his name stands first on the Declaration of Independence. During the Revolutionary War he was a major-general of militia, serving in Rhode Island. In 1780 he was made the first governor of his state and, with the exception of two years, he was re-elected every year until his death. He was a fine speaker and a dignified presiding officer. His large fortune he used liberally. He died at Quincy, Oct. 8, 1793.

GEN. W. S. HANCOCK

Hancock, Winfield Scott, one of the most distinguished generals of the Civil War, was born at Montgomery Square near Philadelphia, Feb. 14, 1824. He graduated at West Point in 1844, served in the War with Mexico, and was a captain in the regular army when the Civil War broke out. He was commissioned brigadier-general in 1861, helped to organize the Army of the Potomac, and did gallant service in the battles of South Mountain and Antietam. He was made major-general of volunteers in 1862. At Fredericksburg he led his corps, 5,000 strong, to the desperate assault on Maryes' heights through a deadly fire from which less than 3,000 came back. At Gettysburg he was in command of the Second Corps, and was severely wounded, but stayed on the field until Pickett's desperate charge was repulsed by his corps. In 1864 he bore an important part in the hard-fought battles of the Wilderness, Spottsylvania and Cold Harbor, at Spottsylvania carrying the Confederate works known as the "bloody angle" and capturing 3,000 prisoners. He was made a brigadier-general in the regular army in 1864, and promoted to major-general in 1866. At the close of the war he was placed in command of the department of the Missouri. From 1872 until his death he was in command of the division of the Atlantic. He was the Democratic candidate for the presidency in 1880, but was defeated by Garfield. He died at Governor's Island, N. Y., Feb. 9, 1886. Hancock was a brave, fearless leader, and an able commander. McClellan called him "superb," and Grant wrote: "Hancock stands the most conspicuous figure of all the general officers who did not exercise a separate command." See *Life* by Junkin and Norton and *History of the Second Corps* by Walker.

Hand, the extremity of the fore limb, including the wrist and the parts below it. The name is usually applied to the human hand and that of apes and monkeys, but, technically, it should embrace the extremity of the fore limbs of other vertebrated animals. The fore limbs are composed of corresponding parts in the different vertebrates; for example, the paddle of a whale, the wing of a bird, the wing of a bat, the fore limb of a dog or a horse are all equivalent structures, with bones, muscles and other parts corresponding to those in the arm of man. The hand proper consists of the wrist or carpus, the palm or metacarpus and the digits or fingers, corresponding respectively to the ankle, instep and toes of the foot. There are in all twenty-seven bones in the human hand — eight wrist or carpal bones, five metacarpals and fourteen phalanges belonging to the thumb and fingers. In man the thumb is opposable, or can be touched to the different fingers, and the hand, therefore, under the direction of the mind is a most marvelous instrument, being adapted to handling with accuracy minute objects, turned to the uses of art etc. In the minds of philosophers this adaptability of the hand has been an important factor in the progress of the race from a barbarous condition to one of a high grade of civilization. The hand is capable of much training, and the cultivation of its powers reacts upon the mind, as is shown in manual training, the educated touch of surgeons etc. The hand of apes is less perfect; it suffices for grasping, but the thumb is not so movable and it lacks the possibilities of the human hand. As is well-known, the feet of apes and monkeys have a grasping power also — the great toe is separated from the others by a considerable space. This led Cuvier to make a group, called the four-handed (*quadrumana*), to contain the apes and monkeys, and another group called the two-handed (*bimana*), for man. The various modifications of the hand in different vertebrates are interesting. In birds the bones above the wrist correspond to those of the human arm, but those of the wrist and hand have been reduced and consolidated; there usually is a rudiment of the thumb, the metacarpal and phalanges of the first finger being well-developed, and the rudiment of the second finger. In the horse more extensive changes have taken place, so that the fore limb rests upon the extreme tip of the third finger; the corresponding metacarpal bone is large and firm. There also are two rudimentary bones (the splint bones) representing the second and fourth bones of the palm of the hand, that formerly were fully developed and had jointed digits corresponding to fingers. See FOOT.

Handel (*hăn′dĕl*), **George Frederick,** a famous musician and composer, was born at Halle in Saxony, Feb. 23, 1685. His passion and genius for music were shown at an early age. When about eight, he was placed under Zachau, organist at Halle, and at nine he was master of the organ, violin and other instruments, and wrote a musical composition every week. His first opera, *Almira*, was brought out in January, 1705, and others followed rapidly. Two years later he went to Italy, where he spent three years and enjoyed a great triumph, visiting Florence, Rome, Naples and Venice. He then visited London, and in 1712 took up his residence there. In 1720 the Royal Academy was founded in the Haymarket, "to secure a constant supply of operas by Handel, to be performed under his direction." Here he remained for 17 years, and produced a great number of operas. His health broke down in 1737, and his career as manager and composer of operas was ended. After resting for a time, he recovered his health, and from this time gave his life to the production of English oratorios. This departure led to his greatest triumph. *Saul*, *Israel in Egypt* and the *Ode for St. Cecilia's Day* were all produced in 1739. *The Messiah* appeared in 1742, followed by many others during the next ten years. Handel's music had now taken wider possession than ever of the public, bringing him both fame and money. In 1750 he went abroad, and after his return wrote *Jephthah*, his last oratorio. In 1752 he had lost his sight almost entirely. He died at London, April 14, 1759. See *Life* by Rockstro.

Hang-Chow (*hăn-kou′*) or **Hangchau,** the capital of the province of Che-kiang in China, is situated on the left bank of the Tsien-tang River, where it empties into the Bay of Hang-Chow. It is one of the great commercial, religious and literary centers of China; has clean, well-paved streets and many magnificent temples; and is a principal seat of the silk-manufacture. It formerly had a population of 2,000,000, but during the Taiping rebellion, in 1861, it was laid in ruins, and its present population is not more than 826,000.

Hang′ing Gar′dens of Ba′bylon. These were once reckoned among the wonders of the world. They are supposed by some to have been built by the imaginary Queen Semiramis, while by others they are ascribed to Nebuchadrezzar. They are said to have formed a square with an area of four acres, and rose in terraces supported on arches of masonry to a height of 75 feet. They were watered from a reservoir built at the top, which was supplied from the Euphrates. They were filled with trees, flowers and fountains; banqueting-rooms were distributed throughout; while the view of the city and surrounding country was extensive and magnificent.

Han′na Marcus Alonzo, U. S. senator, was born at New Lisbon, O., Sept. 24, 1837, and removed to Cleveland in 1852, where he lived until his death in 1904. He was educated at Western Reserve College. Early engaging in business he rose to prominence, becoming head of M. A. Hanna & Co. and president of the Union National Bank, of the Cleveland Railway Co. and of Chapin Mining Co., Lake Superior. He was elected to the U. S. senate in 1897 and in 1904, and was a forceful and influential member.

Han′nay James, D.C.L., historian, was born at Richibucto, New Brunswick, April 22, 1842. He was called to the bar in 1866, was reporter of the supreme court from 1867 to 1873, editing two volumes of its reports, and was thereafter occupied for many years in editing newspapers in New Brunswick and the United States. He has been official reporter of the provincial parliament since 1901. Besides many minor articles he has published *History of Acadia*, *The History of the Loyalists*, *The History of New Brunswick* and *The History of the War of* 1812.

Han′nibal (meaning the grace of Baal), was the son of the great Carthaginian general Hamilcar, and was born 247 B. C. When his father went on his great campaign into Spain, he took Hannibal, then in his ninth year; and it is said that before starting he led him to an altar and bade him swear eternal enmity to Rome. For nine years he was trained under Hamilcar in Spain. After the death of his father he served under his brother-in law, Hasdrubal, until the death of the latter, 221 B. C., when the army with one voice chose Hannibal as their general. Determined to carry out his father's purpose to fight Rome on her own soil, Hannibal marched from New Carthage in 218 B. C. with 90,000 foot, 12,000 horse and 37 elephants. Crossing the Pyrenees, he was met at the Rhone by an army of Gauls. After defeating them, he crossed the Alps in 15 days in the face of obstacles which were overcome by matchless skill and courage. Thousands of his troops perished in the snow and ice and in fighting the native tribes which harassed his march. A part of his Spanish troops he was obliged to send home. When he reached Italy, he had but 26,000 men with whom to meet on their own ground a nation which could put 170,000 trained soldiers into the field. He met the Romans under Scipio at the River Ticinus. The Romans were driven back, and retreated beyond the Po. Hannibal crossed the river, and the first great battle was fought at the Trebia, resulting in the utter defeat of the Romans with a loss of 40,000 men. These battles were fought in 218 B. C. The next year he annihilated the army of the consul Flaminius, near Lake Trasimene, capturing 15,000 prisoners. The following spring he posted his army of 30,000 at Cannæ on the Aufidus. Here he was attacked by a Roman army under the consuls Æmilius Paulus and Terentius Varro. Hannibal drew his army across the mouth of a loop in the river, and ordered his center to retire before the attack of the Romans. The Roman legions pressed into the loop, when Hannibal's infantry, which were strongly posted on either side, fell upon the enemy's flanks, while the Numidian cavalry closed upon the rear. Thus assailed in front, flank and rear, the Roman army, confused and broken, was hewn down through eight hours of carnage till 50,000 men lay dead on the field. "Send me on with the horse, general," cried Maherbal, the leader of the Numidian cavalry; "and in five days thou shalt sup in the capital." But Hannibal knew that his forces were unequal to the task of storming a walled city, garrisoned by a population of fighting men. The soundness of judgment, the patience and self-control he evinced in this hour of intoxicating triumph are hardly less marvelous than the genius by which his success had been won.

Hitherto Hannibal had swept everything before him, but after the battle of Cannæ the tide turned. His niggardly, short-sighted countrymen denied him the support without which success was impossible Still, through long years of struggle in Italy, he was never defeated, and overcame the Roman army again and again. But in 207 B. C. his brother, Hasdrubal, marching from Spain to his aid, was surprised, defeated and slain at the Metaurus by the consul Nero. This battle sealed the fate of "the lion's brood" of the great Hamilcar; but for years Hannibal stood at bay, defying with his thinned army every general sent against him, until in 202 B. C. he was recalled to Africa to repel the Roman invasion. In the same year he met Scipio at Zama; his raw levies fled; his veterans were cut to pieces where they stood; and Carthage was at the mercy of Rome. So ended the Second Punic War, which has well been called the war of a man with a nation and perhaps the most wonderful war in all history. When peace was made, Hannibal became the highest officer in his state and effected many reforms in the government of Carthage. These reforms made him enemies, who caused the Romans to demand his surrender to them. To avoid this, he left Carthage, and years later baffled his enemies by finally taking poison, which, we are told, he carried with him in a ring, and died at Libyssa about 183 B. C. There is not in all history so wonderful an example of what a single man of genius may achieve against tremendous odds as is found in Hannibal, the greatest captain the world has seen. See *Carthage and the Carthaginians* by Bosworth Smith; *Life* by Arnold; and *Hannibal*, by Dodge, in the Great Commanders Series.

Hannibal, a city in Marion County, Mo., on the west bank of the Mississippi, which has grown steadily during the last 20 years. It has excellent facilities for shipping, having eight railroads, six of which terminate there, and competing river-steamers. The city has broad, handsome and well-paved streets, lighted by electricity. The water-supply is obtained from the river, two miles above the city; it first passes by gravity through a system of filters, and is then pumped into reservoirs. The principal manufactures are stoves, shoes, furniture, flour, cigars, lumber, car-wheels and foundry and machineshop products. It is well-equipped with churches and banks, and has an excellent school-system, which includes public, parish and colored high-schools, besides a free public library of 10,000 volumes. Population 18,443.

Hanno'ver, formerly a kingdom of northern Germany, in 1866 became a part of Prussia. Its area is 14,869 square miles; population 2,942,546. It is a part of the great North German plain, except in the south where are the Harz Mountains. It is watered by the Elbe, Weser, Ems and their tributaries. The people are engaged in mining, farming and stockraising. The mines produce iron, silver, zinc, copper, lead and coal. Among Hannover's more important industries are manufactures of linen, woolen and cotton goods, iron, glass, paper and pottery. Göttingen is the seat of a university, and the capital is Hannover, situated 158 miles west of Berlin. It is a center of the North German railroad system and has varied and important manufactures. Population 302,384. Low German is spoken in the rural districts, but high German is the language of the educated classes and is spoken with more purity than in any other part of the empire.

Han'over, a small town in New Hampshire, on the Connecticut River, 55 miles northwest of Concord. Dartmouth College, which is situated here, was the fourth college founded in New England, and grew out of an Indian school in Connecticut, which was moved to Hanover in 1769. It was named after Lord Dartmouth, an English benefactor. The legislature of the state attempted to change its name to Dartmouth University and take control of it, but failed, Daniel Webster making one of his famous speeches in favor of the college. It has 118 professors, 1,229 students and a library of 110,000 volumes. New Hampshire Medical College, Chandler Scientific School and the State College of Agriculture are connected with it. Hanover also has Thayer School of Civil Engineering, Amos Tuck School of Administration and Commerce, Dartmouth Summer-School and Fayerweather School of Tanning. Population of Hanover 2,075.

Hanseatic (*hăn′sē-ăt′ĭk*) **League** or **Hansa,** an association of cities in the north of Germany and adjoining states, which was formed in the middle ages and flourished for several centuries. The object of the League was the mutual protection and development of trade interests. It sought to gain and hold for these cities a monopoly of trade by securing special privileges and favorable conditions from the kings and rulers of the various countries where they had established trade, and thus shut out all rivals. As the cities grew in wealth and commerical importance, the League came to have political influence and power. It supplied money to the kings of England and other countries, and in return received valuable advantages. In 1370 it compelled humiliating concessions from King Waldemar of Denmark, and after that claimed the right of controlling the choice of the sovereigns of that country. The League at one time numbered as many as 77 cities, probably more, including Bremen, Cologne, Lübeck and Hamburg. The affairs of the League were managed by deputies representing the towns belonging to the League, who met, as a rule, every year, usually at Lübeck, where the records of the Hansa were kept. The League began to lose its power in the 16th century. From 1628 onward the only cities which sought to maintain the organization were Lübeck, Hamburg and Bremen. In 1870 these cities became a part of the German empire, and in 1889 all had joined the German customs union. See *Hansa Towns* by Zimmern.

Hap′good, Norman, author and critic, born in 1868 in Chicago, secured the degree of A. B. from Harvard in 1890, A. M. and LL. B. in 1893. Since graduation he has been engaged in critical and journalistic work. In 1895 he joined the staff of the N. Y. *Evening Post*, and in 1897 became dramatic critic of the N. Y. *Commercial Advertiser*. He has written *Literary Statesmen and Others*, *Daniel Webster* and *Abraham Lincoln*, and is a prolific contributor to magazines. He is now editor of *Colliers' Weekly*.

Haps′burg, House of, of which the reigning family of Austria are the representatives, derived its name from the castle of Habsburg in the Swiss canton of Aargau. The founder of the family was Albert, who is mentioned in the annals as Count of Hapsburg in 1153. He was appointed landgrave of upper Alsace by Emperor Frederick I. Under his son, Rudolph I, the family became one of the most powerful in Swabia. Rudolph III (Rudolph I of Austria) was elected emperor in 1273, and some representative of the family has worn the imperial crown almost continuously, either in Austria, Germany or Spain, down to the present time. See *History of the House of Austria* by Coxe.

Har′court, Hon. Richard, K.C., D.C.L., LL.D., son of the late Michael Harcourt, M. P., was born in Toronto, March 17, 1849, and educated at its university. He has been a member of Ontario Legislature continuously since 1878, a member of the cabinet since 1888, and late Minister of Education. He was treasurer of the Province from 1888 to 1898. His home is at Welland, Ont.

SIR WILLIAM HARCOURT

Harcourt, Sir William George Granville Venables Vernon, an English statesman, was born at Nuneham Park, Oxford, Oct. 14, 1827. He graduated with honors from Trinity College, Cambridge, in 1857. He was made queen's counsel in 1866, and in 1868 entered parliament as a Liberal from the city of Oxford. In 1869 he became professor of international law at Cambridge University, retiring in 1873 to become solicitor-general under the Gladstone administration The same year he was made a knight, and during Gladstone's second administration (1880-85) was made home-secretary. He was a vigorous advocate of the Irish Home Rule measures proposed by Gladstone, which were defeated in 1893. From 1895 till his death he was a member of the house of commons, representing West Monmouthshire. On his party's return to power in 1886, he was made chancellor of the exchequer and again in 1892-95. In 1895 he became leader of the Liberals in the house of commons, resigning the leadership in December, 1898. Harcourt was noted as an able and ready debater, and had an intimate knowledge of all public offices, being especially at home in economics and the national finance. He was a writer of great clearness upon his especial topics, and contributed to the *Saturday Review*, and gave a series of articles upon international law to the London *Times* under the name of Historicus. He died on October 1, 1904.

Har'dee, William J., a Confederate general, was born in Georgia about 1815. In the Mexican War he was promoted for gallant service and became a major and lieutenant-colonel. Holding the position of commandant at West Point from 1856, he resigned it in 1861, and was made a brigadier-general and afterward major-general in the Confederate army and given command of a division in Bragg's army. He served at Shiloh, Murfreesboro and Chattanooga, and surrendered Savannah and Charleston. He was the author of *Hardee's Tactics*, which was used in the United States army. He died at Wytheville, Va., Nov. 6, 1873.

Har'dy, Hon. Arthur S., was born in the County of Brant, Ontario, 1837. Called to the Bar in 1865, he was elected to the Legislature in 1873. Appointed Provincial Secretary in 1877, he was re-elected at five general elections. Commissioner of Crown Lands from 1889 to 1896, he became premier and attorney-general of Ontario in 1896. An able lawyer who gave long and valuable service to the province, he died in 1901.

THOMAS HARDY

Hardy, Thomas, British novelist, was born in Dorsetshire, England, June 2, 1840, and educated at King's College, London. He commenced his career as an architect, but after winning a prize and medal for an essay dealing with Colored Brick and Terracotta Architecture, he devoted himself to fiction-writing and dramatic authorship. In 1874 the first of his notable novels appeared in the *Cornhill Magazine* —*Far from the Madding Crowd* — which was later on dramatized, and, with *The Three Wayfarers*, achieved striking success. His other stories include *Under the Greenwood Tree; A Pair of Blue Eyes; The Return of the Native; Western Tales; Life's Little Ironies; Jude the Obscure; The Well-Beloved;* and, the best of all his novels, *Tess of the D'Urbervilles.* See Mr. Lionel Johnson's *The Art of Thomas Hardy.* There is much imaginative power about Mr. Hardy's work, though somewhat marred by a pessimistic vein; while no writer of the time knows English Wessex, especially that section of the old Saxon kingdom in England known as Dorset and Wilts, better than he, or writes of it more delightfully.

Hare, a very common animal with long ears, a cleft upper lip, short tail and long hind legs. The hares and rabbits belong to the same group and are commonly confused; the smaller kinds that make burrows are more properly called rabbits, and the other varieties that lie in small depressions in the fields are hares. As the name (*Lepus timidus*) of the common hare of Europe implies, hares are very timid, but their long hind legs enable them to leap far and they are very swift. The cleft lip is so constant that the name hare-lip is given to a deformity of the lip and roof of the mouth in human beings. In the northern regions the common hare turns white in winter, and is then known as a polar hare. Hares and rabbits inhabit most parts of the world, but originally were absent from Australia and New Zealand; they were imported there but bred so rapidly that, in the absence of natural enemies, they became a great pest to the farmers. The family is best developed in North America, where there are about twenty species and varieties. Their food is entirely vegetable, consisting of herbage, succulent vegetables, roots and bark. They are very prolific; if not held in check they increase at such a rate as to do much damage to agriculture. Rabbit-drives and rabbit-fences have arisen as protests against their depredations, especially in California and Colorado, where they have proven great pests. Their natural enemies are birds of prey, serpents and carnivorous animals — fox, dog, mink, marten, lynx, skunk etc. They are protected by their coloring, remarkable sense of hearing, keen sense of sight and smell, ability to get over the ground in great leaps and agility in turning and doubling when pursued. The common gray rabbit or cotton-tail of the United States is well-known. The species (*Lepus cuniculus*) which is the original of the breeds of pet rabbits in its wild state is grayish-brown above, with reddish color on the neck, black on the lower surface of the tail and whitish on the under part of the body The pet rabbits range in color from white to black and many spotted varieties. The jack-rabbits of the western states are of large size and usually have long ears. Some varieties turn white in winter, and others do not. They are very swift, progressing by long jumps. Like most hares, they make a "form" in the field in which they lie during the day. Although they make no burrows, they take to holes when pursued by hounds.

Hargreaves (*här′grāvz*), **James,** the inventor of the spinning-jenny, was an uneducated weaver and carpenter of Standhill in Lancashire, England, where he was born in 1745. It is said that he was led to the invention from seeing a spinning-wheel, which one of his children had upset, continue to revolve horizontally while the spindle worked vertically. So strong was the prejudice of the weavers against the introduction of his machine, that they broke into his house and destroyed it. He removed to Nottingham in 1767, where he erected a spinning-mill. Three years later he took out a patent for his invention, but, as it was proved that he had sold several machines before the patent was obtained, it was for that reason declared void. Hargreaves died on April 22, 1778. See *Lancashire Worthies* by Francis Espinasse and *Lives of Eminent Mechanics* by Henry Howe.

Har′lan, John Marshall, was born in Boyle County, Ky., June 1, 1833. He was a colonel in the Union army in 1861, and in 1863 he was made attorney-general of Kentucky, and became one of the associate justices of the United States supreme court in 1877. In 1893 he was one of the American arbitrators on the Bering Sea tribunal which met at Paris. Died Oct. 14, 1911.

Har′land, Marion. See TERHUNE, MARY VIRGINIA.

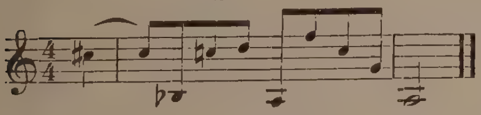
Har′ley, Robert. See OXFORD, EARL OF.

Har′mar, Josiah, an American general in the Revolutionary War, was born at Philadelphia in 1753. He served as lieutenant-colonel under Washington in 1778–80, and with General Greene in the south in 1781–82. He was selected to carry to France the ratification of the treaty with England, which ended the Revolutionary War, and became general-in-chief of the army in 1789. Fort Harmar, at the mouth of Muskingum River on the Ohio, was named after him. He died at Philadelphia, Aug. 20, 1813.

Har′mony, from the Greek word *harmonia*, meaning "a concord of sounds, music, or a system of music" (which itself is probably derived from an ancient root-word meaning to fit or join), is one of the three essentials elements of music, without which music never has existed and never can exist.

If the following succession of sounds, called tones,

EXAMPLE 1



be thought, sung or played, it will be felt to be as meaningless, as incoherent, musically, as the following succession of sounds, called syllables,

EXAMPLE 2

Eightnez zar nebkud you ha

is incoherent and meaningless as language. That is, the succession of tones in Example 1 does not express music, although there is rhythmic coherence; nor does the succession of syllables in Example 2 express language.

In the following succession of syllabic sounds

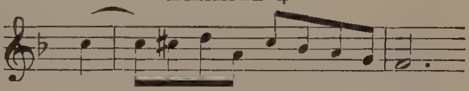
EXAMPLE 3

Nebuchadnezzar ate hay

coherency, unity and meaning — therefore language — appear, although we have precisely the same sounds as in Example 2. The difference is solely in the relation of the sounds in respect to their order and groupings.

Similarly the following succession of tones, all of which are to be found in Example 1,

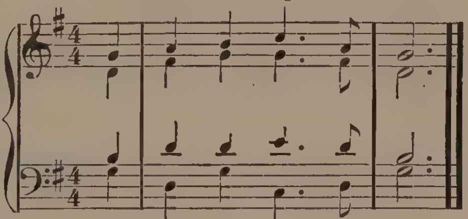
EXAMPLE 4



expresses coherency, unity and music, because a feeling of tonal relationship is immediately recognized. There is a vital distinction to be made, however, between the syllabic and tonal relations. In the former they are largely if not purely arbitrary relations in respect to order and grouping established by usage; in the tonal succession, on the contrary, the relationship is not arbitrary, but immanent in every coherent grouping of tones, whether conceived of successively or simultaneously.

Further observation of melody reveals the fact that each melodic incident suggests a group of simultaneous tones in a definite relation to one another, as represented in the following example:

EXAMPLE 5



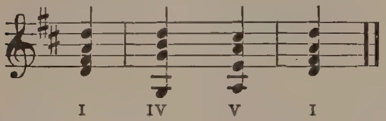
That is, the first, third and sixth tones of the melody suggest the group *g*, *b*, *d;* the second and fifth tones, *d*, *f̄*, *a* (the line over a letter stands for a sharp); and the fourth tone, *c*, *e*, *g*. Here again we see that relation, that is, harmony, is the basis of the unity of these groups of simultaneous tones. Such groups of simultaneous tones expressing definite relationships are called, in general, *chords*.

Besides the simultaneous conception of relations, each chord of the series in Example 5 clearly expresses a definite chord relation or harmony. The first chord expresses the idea of harmonic center, harmonic point of unity, and is called the *tonic harmony*. The second chord expresses the idea of harmonic progression to the tonic harmony, and is called the *dominant* harmony. The third chord is tonic. The fourth expresses progression through the dominant (fifth chord) to the tonic harmony, and is called the *subdominant* harmony. Tonic is represented by I, dominant by V, subdominant by IV.

It is plain from this that melody expresses two distinct conceptions of relationships or harmony: first, those relationships constituting the unity of the *simultaneous* grouping of *tones*, called, in general, *chords*, as we have seen; and secondly, those relations constituting the larger unity of *progressive* groupings of *chords*, called, in general, *tonality*. Chord and tonality are, therefore, distinctly harmonic ideas.

These three harmonies and their chords express not only a general but a specific idea of tonality, called *diatonic* tonality, and is illustrated in the following example:

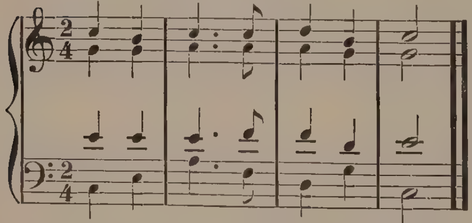
Example 6



Besides the three harmonies, diatonic tonality involves seven melodic incidents: 1, 3, 5 = tonic chord; 5, 7, 2 = dominant chord; 4, 6, 1 = subdominant chord. Chord also involves the harmonic unit called *interval*—the relation of any two of these melodic incidents. These are called *primes*, *seconds*, *thirds*, etc., according to the number of degrees involved.

In the following example:

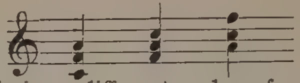
Example 7



besides the tonic, subdominant and dominant harmonies, called *primary* harmonies, the second, third and fifth chords present three new harmonic ideas called, respectively, *mediant*, with its chord, *e*, *g*, *b*; *submediant*, with its chord, *a*, *c*, *e*; and *supertonic*, with its chord, *d*, *f*, *a*. These are designated as *secondary* harmonies.

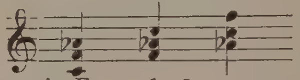
Each tone in the chord-groups of the following example:

Example 8



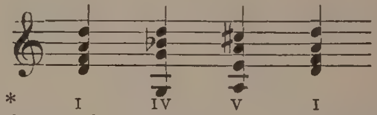
although in a different order of grouping, expresses essentially the same idea of relationship. *F* is felt to be the basic incident, called *root*, and defined as such by the tone *c*, called *fifth*. This root-defining nature of *c* becomes apparent if we substitute b̲ (the line under the letter stands for a flat), in which case *f* no longer appears as the basic incident or root. The remaining incident of the chord is a variable element, illustrated in Example 9:

Example 9



The tone *a* in Example 8 expresses a relatively bright color, called the *major mode*; *a*, in Example 9, a dark color, called the *minor mode*. This color incident of the chord is called the third. Chord, therefore, is a harmonic unity involving root, third and fifth, and named by the root-tone, *i. e.*, chords of *a*, *b*, etc. Applying this dual nature of the chord to Example 6, substituting the minor for the major mode of the tonic and subdominant chords, as follows,

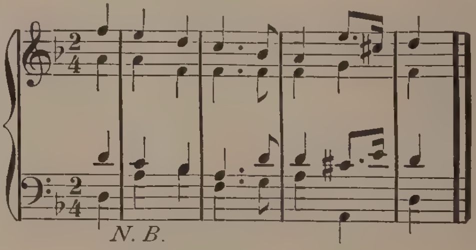
Example 10



no change is apparent in the harmonic character of each chord; the first chord is still tonic, the second chord subdominant, the third chord dominant. All that has been changed is the character, the mode of the tonic and subdominant chords.

In the following example:

Example 11



we find a change, also, in the mode of the dominant (N. B.) chord. This change of the mode of the chord (N. B.) does not affect its dominant character. The inclusion of the minor mode of the tonic, dominant and subdominant chords adds three new melodic incidents to the diatonic tonality,—minor 3 or *mā* (*may*) of the tonic; minor 6 or *la* of the subdominant; and minor 7 or *tā* of the dominant.

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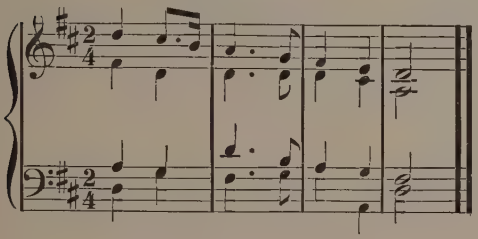
* Minor chords are represented by small numerals.

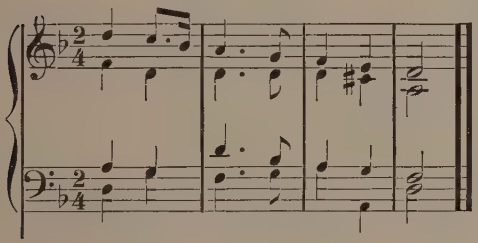
The first phrase of the familiar hymn: "Joy to the world, the Lord is come,"

EXAMPLE 12



presents the tones derived from the major mode of diatonic tonality in the closest order of succession from upper *doh* to lower *doh*. Such a succession of the tones of any tonality is called its *scale*—in this instance the *diatonic* scale. Scale, therefore, is simply one melodic ordering of the tones of tonality. This same melody can be translated into the minor mode, and the same harmonies, chords and harmonic base applied.

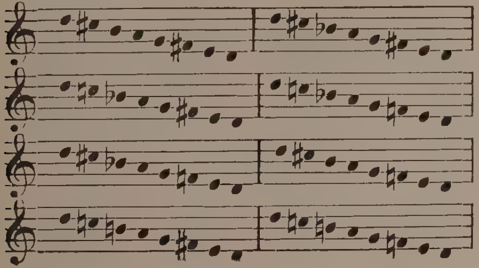
EXAMPLE 13



The solidarity of the two modes of diatonic tonality is thus clearly demonstrated. It also is plain that, since scale is not the foundation of music and tonality but is one of the melodic expressions, diatonic tonality furnishes many scales, illustrated in the following example:

EXAMPLE 14

Diatonic Tonality
Key of D

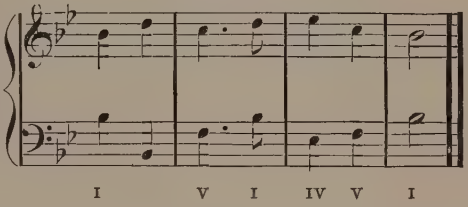


To summarize: Harmony is all the simultaneous and progressive conceptions of the tonal relationships involved in tonality. Tonality is the unity involving all such harmonic ideas. Melody is the outlining, through tonal succession, of a definite conception of tonality. Key is the definite group of tones expressing tonality. Scale is the stepwise ordering of these tones from *doh* to *doh*.

The first study of harmony should consist in an effort to discover in one's own mind, and to express, original melody. For, the moment that melody is conceived in thought, harmony and tonality are expressed.

The second step in the study of harmony should consist in an effort to imagine one or more accompanying melodies which shall more or less clearly express definite harmonies suggested by the original or given melody, technically called the *cantus*. These accompanying melodies may move above or below the *cantus*, and are of two distinct orders: (1) the *harmonic melodies* which simply outline the harmonic *bases* or fill in the chords of the harmony (see Examples 5, 7, 11, 12 and 13) and (2) the *contrapuntal melodies* which not only outline the harmony but have the true melodic significance.

EXAMPLE 15



The next step in harmonic study would involve the completing of the expression of the harmonies by the filling in of the inner harmonic melodies and, also, the giving of many contrapuntal melodies to the original or given *cantus*. To the latter class of compositions the term polyphony more strictly applies. Where all the melodies but one are mainly harmonic, a composition assumes the character of what is called monody, although polyphonic in the sense of many voices.

Further development of the subject is impossible within the space allowed. It remains to say, however, that in the above simple outline of the primary elements of harmony and the elementary processes for the development of harmonic conceptions all the essential principles have been elucidated. The further study and development of the subject lies solely in the enlargement in respect to the amount and complexity of the harmonic material, greater insight into its artistic possibilities, and application to the structural and æsthetic development of the greater forms of musical art. C. B. CADY.

Harm'sworth, Alfred, Lord Northcliffe, a well-known and enterprising newspaper and magazine proprietor, was born in 1865 at Chapelizod, near Dublin, Ireland. His career as a journalist began upon the staff of the *Illustrated London News* in 1862. He is the founder of *Answers*, the *London Daily Mail* (1896), owner of *The Times* and many periodicals. As Mr. Harmsworth, he equipped an Arctic expedition in 1894, known as the Jackson-Harmsworth expedition. While in the United States in 1900 he attracted general attention by his forecast, which was illustrated by an actual issue, that the newspaper of the future would be something like a quarto of thirty-two pages. In 1904 he was made a baronet, and in 1905, Lord Northcliffe. His brothers are associated with him as publishers.

Harold II (*hăr'ŭld*), the last of the native English kings, was born about 1022, and was the son of Earl Godwin. At an early age he was made earl of the East Angles, and in 1053 succeeded to his father's earldom of the West Saxons. He became the right hand of Edward, king of the West Saxons (Edward the Confessor), and directed the affairs of the kingdom with a rare union of gentleness and vigor. King Edward died at the beginning of 1066, and with his last breath recommended that Harold be chosen king. He was crowned on Jan. 6, and at once was called to defend himself against two formidable enemies. Tostig, whose earldom of Northumbria had been taken, securing the aid of the king of Norway, marched against him. Harold met his enemy at Stamford Bridge, and defeated him after a bloody struggle. Four days later William, duke of Normandy, landed on the English coast. Harold hastened to meet him and fell on the bloody field of Hastings or Senlac (Oct. 14, 1066). No king ever fought more heroically for his crown. His tragic story has been made the subject of a novel by Bulwer-Lytton and of a drama by Tennyson. See *History of the Norman Conquest* by Freeman.

Haroun=al=Raschid (*hä-rōn'äl-răsh'id*) or Aaron the Just, caliph of Bagdad, was born in 763 and became caliph in 786. He was a scholar and poet, and by his taste and hospitality made his court the center of all the wit, learning and art of the Moslem world. The government of his kingdom he left to his grand vizier, Barmecide Gahya, and his four sons, and they served him well. But at length Haroun conceived a deep hatred of the vizier and his sons, and in 803 caused them to be put to death. The affairs of the kingdom now quickly fell into confusion, and rebellion broke out in every corner of the empire. Haroun marched in person against the rebels, but was attacked with apoplexy and died at Tûs in March, 809. Haroun the Magnificent is made the hero of many of the stories of the *Arabian Nights*, which have thrown a false halo around his memory; for with all his accomplishments he was in heart cruel. See *Life* by E. H. Palmer, in the New Plutarch Series.

Harp, a stringed musical instrument, much esteemed by the ancients. The Egyptian harp is shown in the most ancient sculpture, and stood seven feet high. The harp mentioned in the Bible was small, and could easily be carried in the hand. In Ireland the harp was a favorite instrument from the remotest times. The Italians of the middle ages believed their harp to be derived from Ireland. The most familiar forms of the harp are the Italian, the mediæval and the pedal harp. The first is now little used, being very imperfect. The second is in the form of a triangle, with a sound-board and gut-strings. It is always tuned in the key of the music, while the strings are altered to suit any variations from the key by pressure of the finger or by turning the tuning-pins of certain notes. The pedal harp has seven pedals, by which each note of the scale, in all the different octaves, can be made a semitone higher.

Har'per's Ferry, a town of West Virginia 81 miles west of Baltimore. It is situated amid beautiful scenery at the junction of the Shenandoah and Potomac Rivers, where the latter is crossed by the bridge of the Baltimore and Ohio Railroad. It is celebrated as the scene of John Brown's raid in 1859; and here in 1862 a Union force of 11,000 men surrendered to Stonewall Jackson. Population 766.

WILLIAM RAINEY HARPER

Harper, William Rainey a prominent American scholar and educator. He was born at New Concord, Muskingum County, O., July 26, 1856. He graduated at fourteen from the Presbyterian College in New Concord, and later studied at Yale University. He was principal of a Masonic institute for boys at Macon, Tenn., in 1875, and in 1876 was placed in charge of Denison University, a Baptist college, at Granville, O. He became professor of Semitic languages in the Baptist Theological Seminary, near Chicago, in 1879. From 1886 to 1891 he was professor of Semitic languages and Woolsey professor of Biblical literature at Yale University. In the latter year he was chosen president of the University of Chicago, adding to that office the duties of professor of Semitic literature. He was remarkably successful in raising large sums of money for the permanent endowment of that institution, obtaining many millions of dollars and equipping it with every facility for continuous academic terms and postgraduate instruction. He founded and for a time edited the *Biblical World* and the *American Journal of Semitic Languages and Literature*, the *American Journal of Theology*, *The Hebrew Student* and *Hebraica*. His chief published works embrace *Elements of Hebrew*, *Hebrew Vocabularies*, *Hebrew Method and Manual*, *Elements of Hebrew*, *a Critical and Exegetical Commentary on Amos and Hosea* and *The Trend of Higher Education*. He died on Jan. 10, 1906.

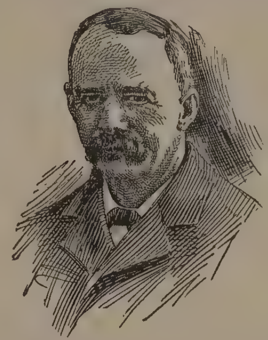
Harp′ies (whose name means the swift robbers), fabled creatures of Greek mythology, held to be ministers of the vengeance of the gods. Various accounts are given of their number and parentage. Homer mentions but one; later writers recognize three and call them the daughters of Poseidon or of Typhon. They are described as hideous monsters with wings, of fierce and loathsome aspect, with faces pale with hunger.

Harp′sichord, a keyed musical instrument, formerly much used but now little known. The sound from the strings was produced by a small piece of crow-quill or a piece of hard leather, which projected from a slip of wood called the jack, that stood upright between the strings and was pushed upward by the key, till the quill or leather twitched the strings, producing a rather shrill sound. After the invention of the pianoforte, the harpsichord was gradually superseded by the new instrument.

Har′raden Beatrice, an English writer of fiction, was born at Hampstead, England, Jan. 24, 1864. She was educated in Holland and England, graduating at the University of London. In 1891 she wrote for children *Things Will Take a Turn*, and in 1893 *Ships that Pass in he Night* appeared. The latter immediately attracted unusual attention. Since that date she has written several books of less note, including *In Varying Moods*, a collection of stories; *The Remittance Man*, dealing with an American subject; *Hilda Strafford; Untold Tales of the Past;* and *The Fowler*.

BEATRICE HARRADEN

Har′riman, Edward Henry, an American capitalist and railroad man, was born at Hempstead, N. Y., in 1848. He received only a common school education, and at 14 entered a broker's office in New York City. In 1878 he became a stockbroker himself, founding a firm which still exists. Within fifteen years he had acquired a fortune and had made a thorough study of American railways. In 1883 began his active interest in the management of railways. In 1898 he formed a company which acquired the Union Pacific Railroad, which had been in the hands of a receiver. Harriman was made president of the road, which under his management soon became a strong, efficient and profitable line. In 1901 he acquired the Southern Pacific, thus placing himself in possession of a system comprising two trunk-lines with a total length of 15,000 miles. With powerful financial banking Harriman became increasingly aggressive in extending his power, until in 1908 the roads under domination of this interest included the Illinois Central, Baltimore and Ohio, the Erie and other lines, with an aggregate mileage of 29,000 miles and a capitalization of $2,350,000,000. He had also acquired an interest in the Gould transcontinental lines. Died Sep. 10, 1909.



EDWARD HENRY HARRIMAN

Har′rington, J. B. Ph.D., LL.D., is director of the Macdonald chemistry and mining building and Macdonald professor of chemistry in McGill University. He was born at St. Andrews, Quebec, Aug. 5, 1848, and educated at McGill and Yale Universities, where he took high honors. From 1871 to 1881 he was lecturer in chemistry and mineralogist to the geological survey of Canada, being appointed David Greenshields professor of chemistry and mineralogy in 1883. He has held many offices of honor in learned societies, and has written many monographs, including a biography of Sir William Edmond Logan.

Har′ris, Joel Chandler, American journalist and author, editor of the Atlanta *Constitution*, wasborn at Eatonton, Ga., Dec. 8, 1848, and like not a few who have made names for themselves in letters, he had his first employment at the printer's case. He then studied law, and for a time practiced at Forsyth, Ga., but after a while he forsook law for literature, obtained a post on the Atlanta

Constitution, and at length became its editor. By this time he had made a loving and faithful study of the negro in the south. Recognizing the darkey's artistic possibilities in literature, he set himself to portray negro-life and dialect, as he so intimately and accurately knew it. How admirable was the study is manifest from even his first book, which appeared in 1880, entitled *Uncle Remus*. Never before had the negro and plantation-life been so aptly sketched as in "Brer Rabbit" and his darkey brothers in Georgia. This and his subsequent writings gave the author a secure place in American literature. His later books include *Mr. Rabbit at Home; On the Plantation; Sister Jane; Balaam and His Master; The Story of Aaron In the Wildwood; Plantation Pageants;* and *Chronicles of Aunt Minervy Ann*. Among his works in a more serious vein are *H. W. Grady* and *The Making of a Statesman*. He also wrote *Tales of the Homefolks; Stories of Georgia* and *Georgia*. He died on July 3, 1908.

JOEL CHANDLER HARRIS

Harris, Robert, C.M.G., has been president of the Royal Academy of Canada since 1893. He was born in Wales and came as a child to Charlottetown, P. E. I., where he early displayed artistic talent. He studied at the Slade school in London, under Bonnat in Paris and in Italy, Belgium and Holland. He was the director of the Art school in Montreal from 1883 to 1887. His paintings are nearly all devoted to Canadian subjects, and he has painted many portraits of Canada's leading men. He has exhibited and gained prizes at the expositions in Paris, Chicago and Buffalo.

Harris, William Torrey, an American educator. He was born at Killingly, Conn., Sept. 10, 1835, and was educated at Phillips Andover Academy, Yale College and Germany. He was superintendent of the St. Louis public schools from 1868 to 1880; was founder of the Philosophical Society of St. Louis and of the *Journal of Speculative Philosophy*, the first periodical of its kind in America. He was made president of the National Educational Association in 1875, represented the United States government at the Brussels International Congress of Educators in 1880, and in 1889 prepared the official *Statement of the System of Education of the United States* for the Paris and Vienna Expositions, and was appointed United States commissioner of education by President Harrison. This important office he held from 1889 to 1906, when he resigned.

Har'risburg the capital of Pennsylvania, was founded in 1785, and became the state capital in 1812. It is situated in the midst of beautiful scenery, on the Susquehanna, which is crossed by two bridges for railroads and two for driving. It contains the capitol, state arsenal, state insane asylum and 81 churches, including a Roman Catholic cathedral, with 222 good public-school buildings, and several institutions for higher education, besides state, public and school libraries. The prosperity of Harrisburg is to a large extent due to its facilities for communication with the coal and iron districts of the state. It has a number of blast-furnaces and rolling-mills and large manufactories of steel and iron, including boilers, machinery, nails, files, agricultural implements, engines, cotton goods, flour, bricks, shoes, brooms, gents' furnishings, woolen, knit and silk goods, electrical and plumbers' supplies. Furniture, stoves and typewriters are also produced, and there is a large trade in lumber. Harrisburg has the service of seven railroads and two electric street-railways, besides electric interurban lines. Population 64,186.

Har'rison, N. J., formerly called East Newark, a town in northeastern New Jersey, on the Passaic, connected by a bridge across it with Newark. Its industries include large steel-works, shade-roller and trunk factories, cloth, thread, wire, cutlery and machineshops and establishments for the manufacture of electrical supplies, marine engines, machinery, tubes, leather, ink and refrigerators. The famous Worthington pumpworks, although not yet completed, employ between five and seven thousand men. Its civic outfit includes, besides good schools and churches, the usual adjuncts of an ambitious, modern city, and it has the service of three railroads. Population 14,498.

Harrison, Benjamin, twenty-third president of the United States, was born at North Bend, Ohio, Aug. 20, 1833. His grandfather, William Henry Harrison, was the ninth president, and Benjamin's father was William Henry's third son. Benjamin Harrison graduated at Miami University, at Oxford, O.; in 1852, and two

BENJAMIN HARRISON

years afterward earned his first money as a crier in the Federal court in Indianapolis, where he had gone to commence practice as a lawyer. He was elected supreme-court reporter of Indiana in 1860, but joined the army during his term. In 1862 he raised a company, of which he was made second lieutenant. As colonel of the 70th Indiana volunteers, he was ordered to Kentucky. He took part under Sherman in the Atlanta campaign, and distinguished himself at Resaca and at Peach Tree Creek. He also was engaged in the battle of Nashville in December, 1864, under Thomas; and in 1865 was made brevet brigadier-general. At the close of the war he again took up the practice of law. In 1876 he was nominated for governor of Indiana, but was defeated, though running 2,000 votes ahead of his ticket. He declined a seat in Garfield's cabinet in 1880. In 1881 he was chosen United States senator from Indiana. In 1888 he was nominated for president by the Republicans. The campaign turned largely on the question of protection and free-trade, and resulted in Harrison's election over Cleveland by the votes of all the northern states except New Jersey and Connecticut. His administration (1889-93) was an able one, especially in its dealings with foreign questions. Its main features were the Pan-American Congress, held at Washington to promote commerce and more friendly relations between the republics of North and South America; the dispute with Great Britain in regard to the right of the United States to protect the seals in Bering Sea; the McKinley tariff bill, including reciprocity in trade with foreign countries; the dispute with Chile, because of the attack on American sailors at Valparaiso; and the dispute with Italy, because of the lynching of Italians in New Orleans. He was renominated in 1892, but was defeated by Cleveland. He died at Indianapolis on March 13, 1901.

Harrison, Frederic, an English lawyer, publicist and author. He was born at London, Oct. 18, 1831; was educated at King's College, London, and at Wadham College, Oxford. He became professor of jurisprudence for the Inns of Court in 1878, and was a member of the royal commission on trades-unions from 1867 to 1869. He was secretary to the royal commission for the digest of the law from 1869 to 1870, and was a member of the state-trials committee in 1888. He was president of the London Positivist committee, and as such published numerous articles on positivism, and was a voluminous writer in the technical and scientific periodicals. He is the author of *The Meaning of History; Order and Progress; Social Statistics;* a translation of the second volume of Comte's *Positive Polity; The Choice of Books; Oliver Cromwell;* and a large number of lectures on social, historical and religious topics. His later writings embrace a *Life of Chatham; Nicephorus;* a *Tragedy of Modern Rome;* and *Memories and Thoughts*, a volume on men, books, cities and art. In 1906 he received the honorary LL.D. from Cambridge.

Harrison, Mrs. Burton, an American writer, was born near Alexandria, Va., April 25, 1845. Her ancestors took prominent parts in public affairs in colonial times and during the Revolution. She was educated in the private schools of Virginia, and was married in 1867 to Burton Harrison, who removed to New York city and engaged in the practice of the law. Mrs. Harrison's first book, *Goldenrod, an Idyll of Mount Desert*, had for its theme scenes and incidents at Bar Harbor. Several years later she wrote *Bar Harbor Days*. Her later books include *A Daughter of the South, A Bachelor Maid, An Errant Wooing, A Virginia Cousin* and *A Triple Entanglement.*

Harrison, William Henry, grandfather of Benjamin Harrison and ninth president, was born in Charles City County, Va., Feb. 9, 1773. His father was one of the signers of the Declaration of Independence, which, as chairman of committee, he reported to Congress on July 4 of 1776. After his father's death William joined the army which Wayne was leading against the northwestern Indians, and showed great gallantry at the battle on the Miami in 1794. He left the army in 1798. He represented the Northwest Territory as a delegate in Congress in 1799-1800, and succeeded in passing an important law relating to the sale of the Federal land in small parcels; and in 1800, when Indiana Territory was formed, which included the present states of Indiana, Illinois, Michigan and Ohio, he was appointed governor. He labored bravely to prevent war with the Indians, but was compelled to quell Tecumseh's outbreak and beat off a fierce and treacherous attack, which ended in an important victory at Tippecanoe on Nov. 7, 1811. In the War of 1812, as chief commander in the northwest, he repulsed the British forces under Proctor, and, aided by Perry's victory on Lake Erie pursued the invaders into Canada, where he totally routed them in the battle of the Thames on Oct. 5, 1813. He was elected to Congress in 1816, becoming United States senator in 1824. In 1828 he went to Colombia as ambassador,

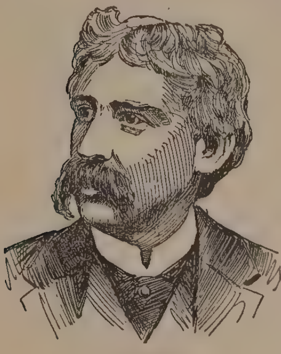
WILLIAM HENRY HARRISON

was recalled in 1829, and for 12 years was clerk in a county-court in Ohio. In 1836 he received 73 electoral votes for the presidency against Van Buren's 170; but four years later, the Whig party having united, he defeated Van Buren, obtaining 234 votes to the latter's 60. He died one month after his inauguration, on April 4, 1841, John Tyler, the vice-president, succeeding him.

Har'row, a great English public school, is located at Harrow-on-the-Hill, Middlesex. The school was founded in 1571 by an English yeoman, John Lyon. At first merely local, in 1660 the school began to attract pupils from a distance. Harrow School has upwards of 600 pupils, whose instruction and discipline follow the Etonian model The great linguist and oriental scholar, Sir William Jones, was educated at Harrow; as were Lord Palmerston, Lord Shaftesbury, Archbishop Trench, Bruce the African explorer, Reel, Admiral Rodney, Byron, Sheridan, Anthony Trollope, Theodore Hook, Merivale and Cardinal Manning. The town has an interesting memorial in the church of St. Mary, said to have been founded by Archbishop Lanfranc.

Hart, Joel T., an American sculptor, was born in Kentucky in 1810. He had very little education, but learned to read by the light of a woodfire, and read everything he could get hold of. While working as a stonecutter in Lexington, Ky., he began modeling busts in clay, and succeeded in making fine likenesses. One of Cassius M. Clay brought him his first order for a bust in marble, and soon after the Ladies' Clay Association of Virginia ordered a marble statue of Henry Clay, which is now in the capitol of Richmond, Va. The colossal bronze statue of Clay at New Orleans and the statue of Woman Triumphant in the courthouse at Louisville, Ky., are his work. He went to Florence, Italy, in 1849, and died there on March 1, 1877. See *Book of the Artists* by Tuckerman.

Harte, Francis Bret, an American writer, was born at Albany, N. Y., Aug. 25, 1839. Going out to California in 1854, he tried school-teaching, mining and typesetting in turn. While working in the office of the *Golden Era* in San Francisco, he wrote his first sketches of the mining-regions and people he was familiar with. In this he struck a new vein in literature, and became popular at once, his success gaining him a place as editor on the *Golden Era*. He founded the *Overland Monthly* in 1868, and some of his best stories were contributions to it; such as *The Luck of Roaring Camp, The Outcasts of Poker Flat* and *Truthful James.* Returning to the east, he contributed to the *Atlantic Monthly*, and lectured upon pioneer life in California. He was United States consul at Crefeld and Glasgow. After 1885 he lived in London. He wrote a great deal, and showed power in several directions, notably in romances, in *Thankful Blossom, Two Men of Sandy Bar, A Phyllis of the Sierras* and in the poems *John Burns of Gettysburg, Dickens in Camp* and *The Heathen Chinee*, but was most effective in the line of his first work. He died on May 5, 1902.


BRET HARTE

Hart'ford, the capital of Connecticut, is situated on the right bank of Connecticut River, 50 miles above its mouth and 112 from New York. Since the original Dutch fort of 1633, which occupied the same site, the settlement in 1635-36 by a colony from Massachusetts and its incorporation as a city in 1784, it has risen to the rank of the second city of Connecticut in population. It shared with New Haven the rank of capital up to 1873, when it became the sole capital. It is a handsome city, with fine public buildings and many tasteful private houses. It is perhaps best known for being the headquarters of a number of great insurance companies and of the extensive manufactories of Colt's pistols and gatling guns. Engines, machines, boilers, hardware, stoves and wooden-wares are largely made, and it has a very considerable trade in Connecticut tobacco. It has an imposing state capitol of white marble, a state arsenal and a United States post-office and courthouse. The Wadsworth Athenæum and a fine high-school building are among the other equipments of the city, together with a Congregational theological seminary, a large hospital, asylums for orphans, the deaf and dumb and the insane; and, also, several important libraries. On the outskirts are the new buildings of Trinity College (Episcopal), founded on the present site of the capital in 1823. One of the "sights" of the city for many years was the "Charter Oak," in which, it was said, was hidden the charter of Connecticut, when its surrender was demanded by Governor Andros. Population 98,915. See *River Towns of Connecticut* by Charles M. Andrews.

Hartford Convention, The, was an assembly of delegates from the New England states, held at Hartford, Dec. 15, 1814, as proposed by the Massachusetts legislature The war with Great Britain (1812–14) had from the first been opposed by the majority of the people of New England, who were Federalists and regarded the war as merely a party measure of the Democrats; and in view of the destruction of the commerce and the fisheries, which were the chief interests of New England, this convention was called to plan means of security and defense. It sat with closed doors for 20 days, and, being supposed to be of a treasonable character, was watched by a military officer of the government. The convention prepared a report, recommending the adoption of measures by the different state legislatures that would protect their citizens from being pressed into the military or naval service by force. No treasonable act was committed, no treasonable intention was proved; yet the suspicion of disloyal tendencies clung to the convention, and completed the ruin of the Federalist party in the election of 1816. Some ground for public suspicion was inferred by the fact that a section of the Federalist leaders who, in 1804 and 1809, had seriously discussed the question of dissolving the Union and forming an eastern confederacy, were foremost in bringing the convention about; the charge, therefore, of aiming at a kingdom of New England was not excuseless. Men of the highest public character who were delegates, however, defended the pure purpose and patriotism of those who took part in the proceedings, and the charges of treasonable designs are now regarded as baseless.

Har′vard University. See UNIVERSITIES.

Har′vest-Moon. Although the moon usually rises later by a considerable interval on each successive night, owing to her motion about the earth, yet the further one goes toward the poles, the greater is the variation in the amount of her retardation. Thus in New York the moon nearest to September 22nd, the autumn equinox, varies in rising only some 25 minutes. This is because she is then in that part of her orbit which makes the least angle with the ecliptic. When a full moon occurs at about this date, it is known as the harvest-moon, because it is very convenient in harvesting to have a rather full moon, lasting almost all night, for several nights together.

Har′vey, William (1578–1657), a distinguished English physician. He is one of the epoch-makers in helping to establish the modern method of science, as noteworthy on that account as for his famous discovery of the circulation of the blood. He is likely to be underestimated in the first direction and to be known only for a single piece of work. He graduated from Caius College, Cambridge, in 1597, and went to Padua to study medicine, receiving his diploma there as doctor in 1602. He practiced in London and became a lecturer in the College of Physicians. In his lectures he brought out, about 1619, his views on the circulation of the blood, and these were published in book form in 1628, under the title *De Motu Cordis et Sanguinis* (On the Movement of the Heart and Blood). But Harvey did not actually see the circulation through the capillaries. His conclusions were based on reasoning from anatomical facts. Malphighi was the first actually to see, in 1661, with the help of a microscope, the circulation of blood in the lungs of the frog, but Leeuwenhoek, in 1668 and thereafter, made so much more of this line of observation that he deserves greater credit. Harvey was a very original and independent thinker, and made many more observations. He was the first great embryologist. His works were translated from the Latin and published in English by the Ray Society. He was physician at St. Bartholomew Hospital and to the king, attending James I and Charles I. See his *Life* by Willis.

Harz (*härts*) **Mountains,** a range in Germany, extending between the rivers Weser and Elbe, south of Brunswick. This range is 57 miles long and 20 broad, containing an area of 784 square miles, and forms an elevated plateau, rising on most sides somewhat steeply from the plains and ridged with irregular and, in some parts, forest-clad mountains. It is divided into upper and lower Harz, with an average elevation of 2,100 and 1,000 feet each. The Brocken, 3,740 feet in height, is the highest peak of central Germany. The Harz are rich in metals and minerals — as silver, iron, lead, copper, zinc, marble, alabaster and granite — and the industries connected with the mines and forests, as well as some cattlebreeding and agriculture, afford employment to the inhabitants, while the rearing of singing-birds is also a source of profit. These mountains form a natural line of division between the low and high German races, and are the scenes of many weird legendary tales in German literature.

Hasdrubal (*hăs′drō-bal*) was the name of several Carthaginian generals, of whom the most famous was the son-in-law of Hamilcar and brother-in-law of Hannibal. Hasdrubal accompanied Hamilcar into Spain in 237 B. C., and gave effective aid in the building up of a Carthaginian dominion in that peninsula. On the death of Hamilcar, 228 B. C., Hasdrubal ruled the new empire and advanced its frontier from the Guadalquivir to the Tagus, and founded a new capital, the modern Carthagena. He was very successful in conciliating the Iberian tribes, and mainly extended his rule by peaceful means. The Roman treaty fixing the frontier line at the Ebro was made with Hasdrubal — not with Carthage — so independent was he of the home government. He was assassinated by a Celtic slave in 221 B. C. Another Hasdrubal was Hannibal's own brother.

Hashish (*hăsh′ēsh*), a preparation of Indian hemp. The drug is used in the east in various ways. Sometimes it is smoked alone or with tobacco; at other times beverages are prepared from it or it is taken in the form of lozenges; or it may be taken as a medicine in the form of a resinous extract or tincture. The effects of hashish differ according to the dose or the constitution of the person using it. Some become quarrelsome; others are lost in reverie. Small doses are apt to produce causeless merriment. The unpleasant after-effects of opium seem to be different, but the hashish habit has the same evil results which follow all such indulgences.

Hastings (*hâs'tĭngz*). The battle to which this name is usually given was fought at Senlac, near Hastings, between the English under King Harold and the Norman invaders under William the Conqueror on Oct. 14, 1066, the former being completely defeated. From that fatal day until now the place has been called Battle Hill. This battle, by which the Norman conquest of England was accomplished, is rated as one of the 15 decisive battles of history. Hastings is in Sussex County on the English Channel, about 60 miles southeast of London. Population 56,000. See Freeman's *Norman Conquest*, Vol. 3.

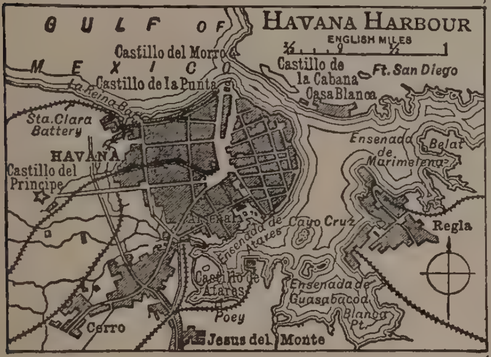
Hastings, Neb., county-seat of Adams County. There are five extensive brickyards, two flourmills, six lumberyards, two foundries, three sash and door factories, a cold storage plant and a packing house. The public buildings are the courthouse, city hall, opera house, Mason's temple, state asylum for the insane, city hospital, Hastings College and Academy and the Young Men's Christian Association. Hastings has five ward-schools and a fine high-school. Population 9,338.

Hastings, Warren, was born at Churchhill in Oxfordshire, England, Dec. 6, 1732. In 1750 he went out in the civil service of the East India Company, and was at first employed in Calcutta. He was in the country at the time of the Black Hole tragedy, but made his escape, joining the refugees at Falta Ghat, returning to England in 1764. In 1769 he returned to India as second-in-council at Madras, proceeding in 1772 to Bengal, where he was promoted to the presidency of the council. A year later the British parliament passed the Regulating Act, under which Hastings was to be governor-general at a handsome salary and to be assisted by a council of five members — three of them appointed from home. This began the trouble. The majority in council, led by Sir Philip Francis (1740–1818), were opposed to Hastings from the first; the finances were in great disorder; and the demands of the Company for remittances were frequent and urgent. Hastings made many internal reforms, and increased the territory and the revenues of the Company. Resigning in 1784, he returned to England, and soon was summoned before parliament for trial. The charges were mainly of giving aid and money to the native princes and of receiving bribes. The interest at first was very great, and the eloquence of Burke, Fox and Sheridan drew large crowds. Many felt, however, that Hastings' public services overbalanced any mistakes he had made. He had prevailed in war, left Bengal in peace and founded an empire which no one thought of giving up. The famous trial lasted seven years, and of the original members of the house of lords who were present when Hastings was called to the bar, only 29 were left to give the final vote of acquittal (1795). He had spent his large property in his defense, and was supported during the remainder of his life by the East India Company. He died on Aug. 22, 1818. See *History of India* by Mill; *Story of Nuncomar* by J. F. Stephen; *Essays* by Macaulay; and *Warren Hastings*, in the Men of Action Series, by Alfred Lyall.

Haussmann (*ōs'mān'*), **Georges Eugene,** was born at Paris, March 27, 1809. He entered the service of the state under Louis Philippe, and under Napoleon III became prefect of the Seine. While holding this office, his reputation was made by his improvement of Paris through widening streets, laying out boulevards and parks and building sewers, barracks, bridges and other public works. The beauty of modern Paris is largely due to Haussmann, and brought him the title of baron; but the enormous expenditure of over $175,000,000 was complained of by the citizens, and he was dismissed from office. "Haussmannizing" is a term now used for the reckless destruction of old buildings to make way for new improvements. Baron Haussmann died at Paris, Jan. 11, 1891.

Hausto'ria (in plants), processes of various kinds sent out chiefly by parasitic plants for absorbing nourishment. In the case of surface parasites the haustoria penetrate the host and absorb its nutrition. In the case of internal parasites the haustoria penetrate the living cells and suck out their fluid contents. Naturally, haustoria are chiefly developed by the fungi, the group which has cultivated the parasitic habit more than any other. The mistletoe, however, is an example of a seed-plant which sends haustoria into the limbs of the trees upon which it grows. The singular is haustorium.

Havana (*hȧ-văn'ȧ*) or **Havannah,** capital of Cuba (*q. v.*) and the principal center of commerce in the West Indies, is situated on the north side of the island. Its magnificent, well-sheltered harbor is entered through a channel 350 yards wide, the entrance to which is defended by several forts. The streets of the older part of the town are narrow and dirty, and the harbor before the American occupancy was polluted by the town sewage. The modern portion, lying to the west, is joined to the older part by broad, tree-shaded avenues and gardens. The houses, which are low, are solidly built of stone, have flat roofs, verandas and barred windows reaching to the ground, and are gay with paint and white marble decorations. The noteworthy public buildings are the cathedral, built in 1724 in the old Spanish style, which for a century and more contained, it was said, the bones of Columbus; and the *Beneficencia*, which, besides being a hospital, includes an orphan asylum, a lunatic asylum and a poorhouse. The main industry is the manufacture of cigars. Sugar, cigars and tobacco are the staple products and the most important of the exports, which also include molasses, rum, wax, iron ore and honey. The chief imports are rice, flour, lard, jerked beef, codfish and coal, besides iron and steel work. Diego Velasquez originally founded Havana on the south coast in 1515, but four years later it was transferred to its present site. In the course of its unfortunate history it has been burned to the ground by buccaneers (1528); plundered in 1555 by another band; captured by a third in 1563; and by the English in 1762. In the 17th century, however, it was made the chief center of Spanish trade in the West Indies and the harbor for the Spanish gold fleets. Population 555,178.

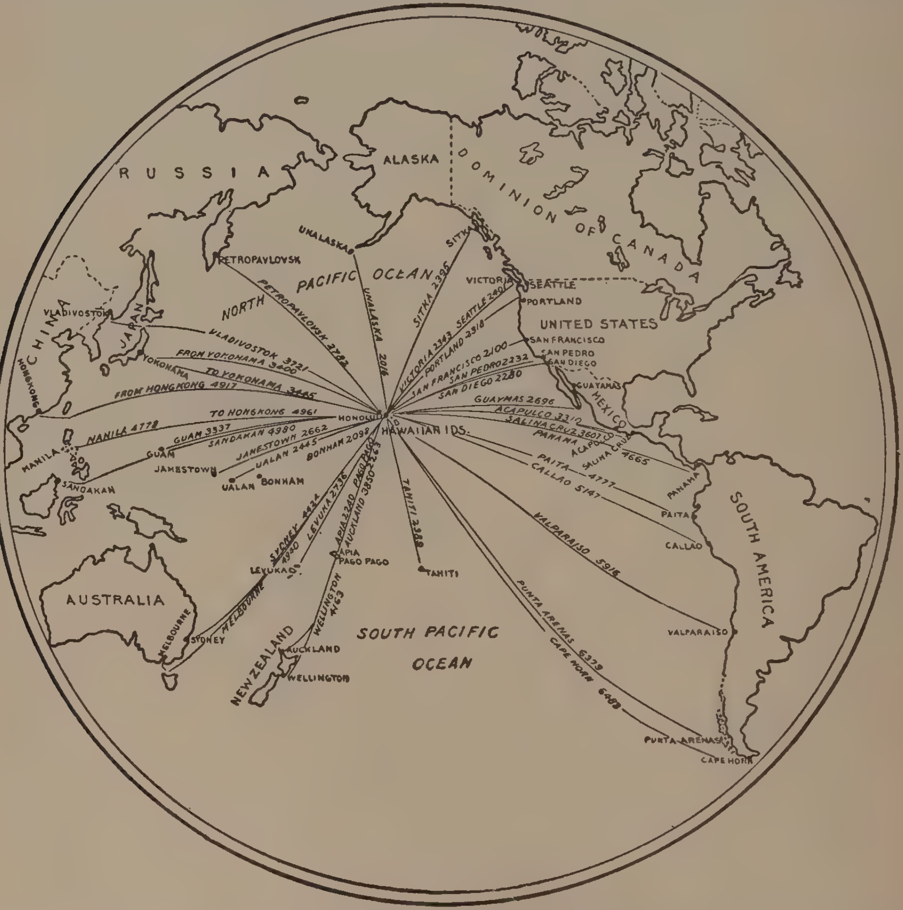


Hav'elock, Sir Henry, one of the English heroes of the Indian mutiny, was born of Danish descent in Durham, England, April 5, 1795. He entered the army in 1815. He was ordered to India in 1823. During the voyage he met with the religious experience which colored all his after-life. Havelock distinguished himself both in the Afghan and the Sikh war, but was only a lieutenant after 23 years' service. When news came, in 1856, of the Indian mutiny, he organized a column at Allahabad, and marched to the relief of the British at Cawnpore and Lucknow. After a forced march with his 2,000 men, he reached Fattehpúr, where he broke the rebel force and, continuing his march to Cawnpore, drove the enemy before him. At the instigation of the infamous Nana Sahib, the miscreants revenged their defeats, before abandoning Cawnpore, by massacring all the defenseless women and children in their hands. Havelock now advanced upon Lucknow. Crossing the Ganges, he fought eight victorious battles, which, together with fatigue and sickness, so thinned his little army that he was obliged to retire upon Cawnpore. General Outram arriving early in September with re-enforcements, Havelock again advanced to Lucknow, and after desperate fighting relieved the beleaguered garrison. The victors were now also besieged until November, when Sir Colin Campbell (afterward Lord Clyde), in his turn, forced his way to their rescue. After the relief of Lucknow, Havelock was attacked by dysentery, and died on Nov. 24, 1857. He was a Christian hero and one of England's noblest soldiers. See *Biographical Sketch* by Brock and *Memoir* by Marshman.

Haverhill (*hā'ver-ĭl*), **Mass.,** is situated at the head of navigation on the Merrimac, 33 miles north of Boston. The chief industry is the manufacture of boots and shoes, in which it is second only to Lynn and gives employment to about 6,000 men in 200 factories; there also are factories for glass, hats, iron, boot and shoe findings and factories for the cut stock. The public schools rank high, and, besides, there are parochial schools, a Brothers' school (R. C.) and Bradford Academy for young ladies, established in 1804. Noteworthy public buildings include the public library, founded in 1875. It contains 100,000 volumes, and has been generously supported by E. J. M. Hale. Hale Hospital and the Y. M. C. A. building should also be mentioned. The Whittier homestead, birthplace of the poet and scene of *Snowbound*, is but three miles from the heart of the city. The house and its surroundings are owned by the Whittier association, and are of great interest to all tourists. Haverhill was settled in June, 1640, under the name of Pentucket. Population 44,115.

Havre (*hä'ver*), a seaport on the northern shore of France, situated north of the mouth of the Seine and, next to Marseilles, the largest shipping center in France. It also is the port from which the larger part of French emigrants set sail. Down to 1516 Havre was but a fishing village, Francis I having built its harbors and fortified it. Population 136,159.

Hawaiian (*hä-wī'yan*) or **Sandwich Islands,** a small archipelago in the northern Pacific, until lately forming the kingdom of Hawaii and named Sandwich Islands by Captain Cook. They are eight in number, and form a beautiful group, running from southeast to northwest — a territory now of the United States. The capital is Honolulu (pop. over 50,000) on the southwest coast of the island of Oahu. For military purposes the islands are attached to the department of California. The Hawaiian Islands lie in the course of vessels bound from San Francisco to China, Japan, New Zealand and Australia, and afford a very convenient coaling station. They are of volcanic formation, many of them bordered, though not surrounded, by coral reefs. The larger islands are mountainous, and Hawaii, the largest, contains the high mountains of Mauna Kea (13,805 feet) and Mauna Loa (13,675 feet). The area and population of the several islands are as follows: Hawaii 4,210 square miles (pop. 55,382); Maui 760 square miles (pop. 25,416); Oahu 600 square miles (pop. 82,028); Kauai 590 square miles (pop. 23,952); Molokai 270 square miles; Lanai 150 (pop. of the two isles, 2,504); Nihau 97 square miles (pop. 172); and Kihulaue 63 square miles. The total area is about 6,640 square miles; the total population (1910) 191,909. There are many Japanese, Chinese and Koreans on the islands; but English is the language in general use in the schools. The natives are chiefly Christians.



Climate and Products. The climate is fairly temperate, the mercury seldom rising above 90° F. and, in the cooler season, rarely falling below 52°. The valleys are beautiful and highly fertile, and are covered with sugar, cotton and rice plantations. The commerce of the islands is gradually increasing.

Exports. In 1876 a reciprocity treaty was concluded with the United States, which led to an enormous development of the sugar-export trade. The other chief articles of export are rice, wool, molasses, tallow and bananas.

History. The islands are said to have been found by Gaetano in 1542, and were rediscovered by Captain Cook in 1778. Formerly each island was governed by a separate king, but early in the 19th century, under Kamehameha I, they were united into one kingdom, whose ruler was vested with almost absolute power. This so remained until about 1886, when the powers of the king were greatly curtailed. Another Kamehameha, who died in 1874, was succeeded by Kalakaua. The latter died in 1891, and was succeeded by Queen Liliuokalani, who was deposed in January, 1893. The republic of Hawaii was proclaimed on July 4, 1894, and annexation to the United States was sought. After four years a treaty of annexation was passed by congress, and on July 7, 1898, the islands became a part of the United States.

The strategic value of the Hawaiian Islands to the United States is supreme. Lying within easy steaming distance of our Pacific coast, they afford a point from which the whole North Pacific Ocean can be patrolled by cruisers and the commerce of the Panama Canal be protected. In 1893 our greatest authority on seapower and naval strategy, Capt. A. T. Mahan, wrote in reference to the proposed annexation of Hawaii: "To any one viewing a map that shows the full extent of the Pacific two circumstances will be strikingly and immediately apparent. He will see at a glance that the Sandwich Islands stand by themselves in a state of comparative isolation amid a vast expense of sea; and, again, that they form the center of a large circle whose radius is approximately the distance from Honolulu to San Francisco. To have a central position such as this and to be alone, having no rival, are conditions that at once fix the attention of the strategist. But to this striking combination is to be added the remarkable relations borne to the great commercial routes traversing this vast expanse. It is rarely that so important a factor in the attack or defense of a coastline — of a sea-frontier — is concentrated in a single position, and the circumstance renders it doubly imperative upon us to secure it if we righteously can." The situation will be clearly seen from the map here given. See, also, PEARL HARBOR.

Government. The islands were organized as a territory of the United States; the new territorial government was inaugurated at Honolulu, June 14, 1900; and the first territorial legislature began its sessions at Honolulu on February 20, 1901. See Miss Bird's *Six Months in the Sandwich Islands.*

Hawk, a common name for birds of prey related to the falcons. These two kinds of birds are often confused. The falcons have a tooth on the upper bill, while the hawks have not. They are found all over the world and about 70 species are recognized. Their wings are shorter than those of the best falcons. Hawks nest alone, not in colonies. They are abundant in the United States; in North America above Mexico there are about 34 species. The sparrow-hawk, pigeon-hawk and duck-hawk stand in a distinct group, belonging to the falcons. The first-mentioned, the smallest American hawk, is an attractive bird and of much usefulness, destroying innumerable grasshoppers and a great many mice. It is a little longer than the robin, its back reddish brown and black, its breast spotted with black. It is found in almost all portions of country. The pigeon-hawk, only a trifle larger than the preceding, dull blue or brown above and lighter below, is very destructive to song-birds and of little use to man. The duck-hawk, above a dingy black and light below, also is a bird that deserves no protection, feeding largely on poultry and game-birds. Other common culprits among hawks are the sharp-shinned and Cooper's, both found throughout the United States. The sharp-shinned hawk is small in size, blue-gray above and white below; has a slender body, long legs and tail; and flies very swiftly. It feeds almost exclusively on song-birds. Cooper's hawk closely resembles the preceding one in form and color, but is considerably larger. It is of great strength and boldness; its flight is strong and rapid; its prey poultry and game-birds, as grouse, quails, pigeons. In Canada the American goshawk is a dreaded enemy of game-bird and poultry, and deserves no mercy. This bird has a black head, is blue-gray above and white below.

SPARROW-HAWK

To turn now to the hawks that merit protection, mention should first be made of the two that have undeservedly been given a bad name, the red-shouldered and the red-tailed hawk — both mistakenly called hen-hawk and chicken-hawk. The former, one of our commonest hawks, is about 18 inches long, is rusty brown in color, and has a black tail marked by bands of white. Mice are its chief food, but it feeds also upon grasshoppers and other insects, and eats frogs, toads, reptiles etc. It does not kill many birds. The red-tailed hawk is larger than the preceding one. This bird Hornaday classes as "the greatest of all destroyers of noxious four-footed animals." Although it sometimes preys upon poultry, less than ten per cent. of its food consists of game-birds and poultry. Far the greater part consists of destructive rodents. The marsh-hawk, familiar on the prairies, has long been appreciated for his service in ridding the land of pests. It may easily be recognized by the large patch of white, low on its back. To avoid making way with a bird of much benefit, it is recommended that the indiscriminate shooting of hawks be discouraged. See FISH-HAWK.

Haw'kins, Anthony Hope, an English writer usually known under his pen-name of Anthony Hope, was born near London in 1863. He took a degree at Balliol College, Oxford, in 1880. His first attempt in literature was *A Man of Mark. Father Stafford* followed, and was regarded as a failure. *Mr. Witt's Widow* and a series of magazine-stories were partially successful. In 1893 *A Change of Air* and *Half a Hero* were published. The same year his first substantial success came with *The Prisoner of Zenda*. Following closely upon this came the *Dolly Dialogues* and, a little later, *The God in the Car*, *Comedies of Courtship* and *The Indiscretion of the Duchess*. In 1896 *The Heart of Princess Osra* was published; in 1897 *Phroso;* in 1898 *Simon Dale*, *Rupert of Hentzau* and *Lady Ursula*. Among his later stories is *Sophy of Kravona*.

Hawkins, Sir John, an English sailor, was born at Plymouth about 1532. He enjoys the unhappy notoriety of having been the first Englishman to engage in the slave-trade (1562). His career as a slave-trader ended in 1567 with his third voyage. He was made treasurer of the navy in 1573, and knighted in 1588 for his able services against the Spanish Armada. In 1595 he was in joint command of an expedition against the settlements in the Spanish Main, but died at sea off Porto Rico on Nov. 12. See Hakluyt's *Voyages* and Kingsley's *Westward Ho*.

Hawk-Moth, any one of a group of moths (sphinxes) with a stout, spindle-shaped body and long, narrow, strong wings. The sucking-tube is very long, in some cases being twice as long as the body; when not in use it is closely coiled like a watch-spring beneath the head. These moths are seen at twilight hovering over a flower like humming-birds, and therefore are sometimes called humming-bird moths. There are several varieties to which the name belongs. The larvæ are usually large; the best-known one is the tomato-worm. The tobacco-worm also is the larvæ of one of the hawk-moths.

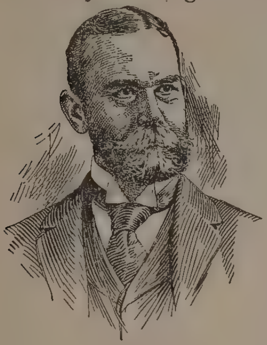
Haw'ley Joseph Roswell, was born at Stewartsville, N. C., Oct 31, 1826. In his childhood his parents removed to Connecticut. He studied law, but abandoned the profession to enter journalism, and in 1861 entered the army as a volunteer. He took part at Bull Run, Port Royal, Fort Pulaski, James Island and Pocotaligo, being brevetted major-general for gallant conduct. He commanded a division at the siege of Charleston and the capture of Fort Wagner. In 1866 he was elected governor of Connecticut, and in 1872 was elected to Congress and soon became a leader on the Republican side of the house. From 1873 to 1877 he was president of the United States Centennial Commission. In 1881 he was elected to the senate, and became a leader in all questions of party politics. He died on March 18, 1905.

Haw'thorne, Julian, an American author, the son of Nathaniel Hawthorne, was born at Boston, Mass., June 22, 1846. He studied at Harvard but did not graduate, leaving that institution to study engineering at Dresden. During the Civil War he was a member of the staff of Gen. McClellan, engaged at work on the New York docks, remaining in this service until 1872. During this period he wrote several short stories for American magazines, and, these proving popular, he turned his attention to literature. He returned to Germany, and in 1873-4 published *Bressant and Idolatry. Garth; Sebastian Strome; Fortune's Fool; Noble Blood;* and *Dust* followed. Meantime he wrote short stories, *A Fool of Nature* gaining the ten-thousand-dollar prize offered by the New York *Herald* in 1896. Hawthorne is an author of several detective stories. He has written many critical papers, and has prepared a text-book on *American Literature*. *Archibald Malmaison* is another of his well-known works. His miscellanies are very numerous.

NATHANIEL HAWTHORNE

Hawthorne, Nathaniel, a distinguished American novelist, was born at Salem, Mass., July 4, 1804. He was the grandson of Daniel Hawthorne, who was commander of a privateer in the Revolutionary War. His father, like many of the other male members of the family, was a follower of the sea, and died when the son was but four years old. He graduated from Bowdoin College in 1825 with Longfellow. His first novel, *Fanshawe*, was published anonymously (1828), but proved a failure. The first book to bring fame was a collection of short stories, called *Twice-told Tales* (1837). In 1850 *The Scarlet Letter*, the book which made his name most widely known, was given to the public. Quickly upon this followed *The House of Seven Gables*, *The Wonder-Book*, *The Snow-Image*, *The Blithedale Romance*, *Tanglewood Tales* and a continuation of *The Wonder-Book* (1853). He was known as one of the most brilliant contributors to the magazines of his day. In March, 1853, he was appointed consul to Liverpool by President Pierce, and remained until the close of 1857. He then spent a year in Italy, which inspired *The Marble Faun* (1858), returned to America, and published *Our Old Home* (1860), sketches of England. He died at Plymouth, N. H., May 19, 1864. Hawthorne is undoubtedly the greatest of American novelists. See *Hawthorne* by Prof. Geo. E. Woodberry, in the series of American Men of Letters, and *Nathaniel Hawthorne* by Julian Hawthorne.

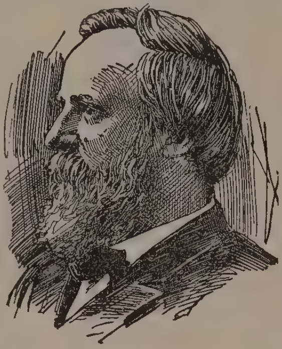
Hay, John, an American writer and diplomat, was born at Salem, Ind., Oct. 8, 1838, and was educated at Brown University. He was admitted to the bar in Illinois in 1861, and became secretary to President Lincoln. He also held the military rank of major and was brevetted lieutenant-colonel. After the war he was successively secretary of legation at Paris, *chargé d'affaires* at Vienna and secretary of legation at Madrid. From 1870 to 1875 he was on the staff of the New York *Tribune.* He published *Pike County Ballads* and *Castilian Days.* With John G. Nicolay he wrote *The Life of Abraham Lincoln.* He became ambassador to Great Britain in 1897, and in 1898 was made secretary of state by McKinley. He helped negotiate the Hay-Pauncefote (see CLAYTON-BULWER) treaty giving the United States sole authority to build the Panama Canal. He won for American diplomacy a commanding position, and for himself a high place as an advocate for peace based upon international candor and fair dealing. He died July 1, 1905.


JOHN HAY

Haydn (*hā'd'n*), **Joseph,** a German composer, was born in the village of Rohrau, on the borders of Hungary and Austria, March 31, 1732. He was the son of a poor wheelwright, but early developed decided musical genius. At the age of eight he was received into the choir of the cathedral of St. Stephen in Vienna, but ten years afterward his voice broke and he lost his position. Thereafter, for some time, he lived in great poverty, earning a small sum by street-playing and serenading, until he hoarded enough to hire an attic and a piano, when his most strenuous studies began. The first recognition he received was from Herr Kurz, a theatrical manager, who heard him playing one of his own compositions under his window and commissioned him to write an opera. His musical theory was directly opposed to that of J. S. Bach and Handel. His first quartet for stringed instruments was written in 1750 and his *Creation* and *The Seasons* in 1795-96. He died on May 31, 1809. His compositions are exceedingly numerous, comprising over 600 in number. See Miss Townsend's *Life of Haydn.*

Hayes (*hāz*), **Isaac Israel,** arctic explorer, was born in Chester County, Pa., March 5, 1832, and graduated in medicine from the University of Pennsylvania in 1853. He conducted three expeditions into the arctic regions, the last in 1869. He was surgeon of volunteers from 1862 to 1865, retiring with the rank of brevet lieutenant-colonel. He died at New York, Dec. 17, 1881. His *Arctic Boat-Journey, The Open Polar Sea* and *The Land of Desolation* rank among the best accounts of arctic travel.

Hayes, Rutherford Birchard, nineteenth president of the United States, was born at Delaware, O., Oct. 4, 1822. He graduated at Kenyon College, Ohio, in 1842, and, after studying law at Harvard, practiced at Cincinnati from 1849 to 1861. During the Civil War he served with distinction and attained the rank of brevet major-general. He was sent to Congress in 1865, and was three times governor of Ohio. In 1876 he was the Republican candidate for president, Samuel J. Tilden being the Democratic candidate. The election developed many exciting complications and engendered great suspicions of unfairness. Congress appointed an electoral commission, which gave the office to Hayes by a vote of eight to seven. Under Hayes' administration the country recovered to a large extent from the financial panic of 1873. The two main features of his policy were civil-service reform and the withdrawal of United States troops from the south. See his *Life* by W. O. Stoddard. He died at Fremont, O., Jan. 17, 1893.


RUTHERFORD B. HAYES

Hayne, Robert Young, an American statesman, was born in South Carolina in 1791, admitted to the bar in 1812, served in the war with Great Britain, and at its close resumed his law-practice in Charleston. He was a member of the state legislature, afterward its speaker, and from 1818 to 1822 attorney-general of the state. During 1823-32 he was United States senator, and proved a great enemy of protection and a bold supporter of the doctrine of nullification or the alleged right of a state to prevent the carrying out of a law that it considered not according to the constitution. One of Webster's ablest speeches was made in reply to Hayne, when he advocated this doctrine. In 1832 he was elected governor of South Carolina. He died at Asheville, N. C., Sept. 24, 1839.

Hays, Charles M., was born at Rock Island, Illinois, 1856. He entered railway service in 1873 as a clerk in the passenger department of the Atlantic and Pacific Railway. He was general manager of the Grand

CHARLES M. HAYS

Trunk Railway from 1896 to 1901, and became vice-president. He is president of the Central Vermont Railway, the Canadian Express Company, the St. Clair Tunnel Company and the Inter national Bridge Company. He is now associated in the work of constructing another transcontinental railway, the Grand Trunk Pacific (*q. v.*).

Haz'ard, Miss Caroline, president of Wellesley College, was born at Peace Dale, Rhode Island, in 1856. Her education was private, and was in part received in Europe from private tutors. Prior to her election to the presidency of Wellesley in 1899, Miss Hazard was known chiefly as the author of *Narragansett Ballads* and *The Narragansett Friends' Meeting.* She had published memoirs of J L Diman and of Thos. Hazard, edited the works of R G Hazard and written minor essays and verses. She has received the degrees of A. M from Michigan and of Litt. D. from Brown.

Ha'zel, species of *Corylus*, a genus belonging to the birch family. The genus contains about seven species distributed throughout the northern hemisphere, three of which occur in the United States. The ordinary hazel, which often makes extensive thickets and produces the common wild hazelnut, is *C. Americana.* The beaked hazelnut (*C. rostrata*) is a fruit from a shrub extending from the northern part of North America south along the mountains. The third species occurs in California.

Ha'zen, William Babcock, an American soldier, was born at West Hartford, Vt., Sept. 27, 1830; and died at Washington, D C., Jan. 16, 1887. He graduated from West Point in 1855, and entered the service against the Indians in California, Oregon and Texas. He raised the Forty-first Ohio volunteers in 1861, and took part in the battles of Shiloh, Corinth and Stone River, where, for bravery, he was made brigadier-general, and at the end of the war was breveted major-general. In December, 1880, he was appointed chief signal-officer. While acting as such, the United States became indebted to him for the present system of weather-signals.

Ha'zleton, Pa., a city in Luzerne County, in an anthracite-mining district, southwest of Wilkes-Barre and 100 miles northwest of Philadelphia. It occupies an elevated position in an attractive section of the country, on the Lehigh Valley and Pennsylvania railroads. It has trolley connection with outlying villages, that within a ten-mile radius give a population of 30,000, and a third-rail electric road establishing hourly communication with Wilkes-Barre. The chief industry of the section is coal, though the town has a number of manufactories of various kinds and has a large local trade. There are a miners' hospital and a state hospital. Several new and modern school-buildings have been erected, and plans for a public library have just been projected. Population 25,452.

Head (in plants), an inflorescence in which the flowers are brought together in a compact head-like cluster, as in the buttonbush, dandelion, sunflower etc. It is the typical flower-cluster of the great composite family. See INFLORESCENCE.

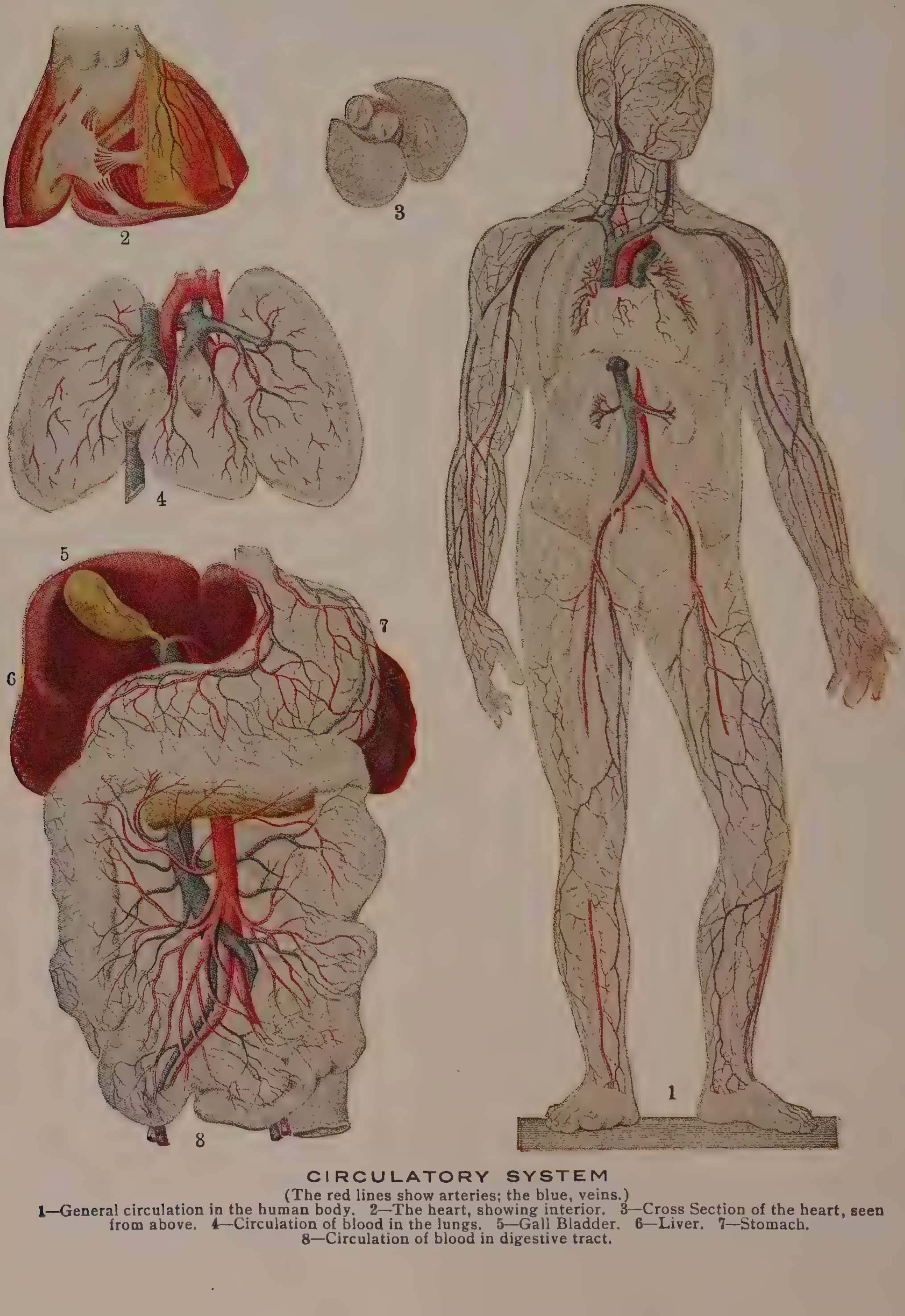
Head'ley, Joel Tyler, an American author, was born at Walton, N. Y., Dec. 30, 1813. He graduated from Union College in 1839, studied theology at Auburn Theological Seminary, and became pastor of a church at Stockbridge, Mass. But ill-health soon compelled him to abandon pastoral work. He became well-known by such historical and popular works as *Napoleon and his Marshals* and *Washington and his Generals.* He died on Jan. 16, 1897.

Hear'ing. See EAR.

Hearst, William Randolph, was born in San Francisco, April 29, 1863. He studied at Harvard, but did not graduate. In 1886 he gained possession of *The Examiner* of San Francisco, a paper that then was on the verge of failure, and quickly made it a financial success and a widely read newspaper. In 1895 he became proprietor of *The Journal* (now *The American*) and *The Evening Journal*, of New York City. He later established *The Chicago American* and *The Examiner*, and now has a chain of eight daily newspapers extending from the Pacific coast to New England. He represented the 11th New York Congressional district in the 58th and 59th Congresses. In 1895 he was nominated for the mayoralty of New York, but was defeated. In 1896 he was nominated by the Independence League for governor of New York, and his candidacy was endorsed by the Democratic party, but he failed of election. Under his leadership, in 1908, a convention of the Independence League was held in Chicago, and Thomas L. Hisgen was nominated as its candidate for the presidency.

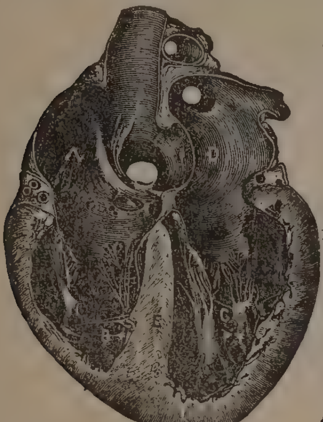
WILLIAM R. HEARST

Heart, the organ that propels the blood. A pulsating organ for this purpose is found in worms, insects, the crayfish, snails and other invertebrate animals. In its simplest form it is a pulsating tube with muscular walls that contract rhythmically. In vertebrates there is considerable variation in the heart of fishes, amphibia, reptiles birds and mammals. In adult fishes the heart consists of two chambers — an auricle and a ventricle — the blood entering the first and passing into the second, from which it is pumped



CIRCULATORY SYSTEM
(The red lines show arteries; the blue, veins.)
1—General circulation in the human body. 2—The heart, showing interior. 3—Cross Section of the heart, seen from above. 4—Circulation of blood in the lungs. 5—Gall Bladder. 6—Liver. 7—Stomach. 8—Circulation of blood in digestive tract.

into the aorta and through its branch. In frogs and toads the heart has three chambers—two auricles and a single ventricle. In reptiles there are three chambers, but the ventricle is divided by an imperfect partition, foreshadowing the four-chambered condition found in higher animals; in the highest reptiles (crocodile) this partition becomes complete. In birds and mammals the heart has two auricles and two ventricles. The right auricle and ventricle receive venous blood and the left ones arterial blood. These facts, based on comparison of the hearts of different animals, become more interesting when it is known that the heart of the highest animal starts, in the embryo, as a single chamber and from that condition passes through all changes up to the four-chambered heart. For example, the heart of the young chick arises after the egg has been incubated two days, and on the third day its beating can be easily seen on opening the egg. At its beginning it is simply a tube with muscular walls formed by the union of two veins. It becomes twisted into an S-shaped, then into a U-shaped tube; it enlarges and the walls get thicker, it then has auricles developed upon it; and by a series of complicated changes it becomes two-, three- and finally four-chambered.


SECTION OF THE HUMAN HEART
(*a*) right aurical; (*b*) right ventrical; (*c*) left ventrical; (*d*) left auricle; (*e*) partition.

Very early in their development the arteries leaving the heart are built on the fish-like type and undergo a remarkable reduction and transformation. These changes furnish clues as to former conditions which help naturalists to read the past history of animals. The heart of the human body also undergoes similar changes. When fully formed, it consists of two auricles and two ventricles, and the right and left cavities are separated by a muscular partition. (See illustration.) The blood is brought from the body to the right auricle and passes through an aperture guarded by valves into the right ventricle; from here it is sent out on the contraction of the walls, through the pulmonary artery, to the lungs. In the lungs it is rendered arterial and passes through the pulmonary veins to the left auricle, thence into the left ventricle and from there into the great aorta, by branches of which it is distributed to all parts of the body—reaching the muscles, glands, brain and all tissues of the body. It then passes through capillaries and enters the veins, by means of which it is brought again to the right side of the heart. The name vein is given to all vessels bringing blood toward the heart, regardless of the quality of the blood, and the artery is used for all blood vessels that carry blood from the heart. It will be at once understood that the pulmonary artery carries venous blood to the lungs and the pulmonary veins arterial blood from the lungs to the heart.

The muscular walls of the left ventricle are very thick, on account of the work devolving upon them of forcing the blood throughout the body. Those of the right ventricle are also thick and strong, but not nearly so thick as those of the left side; their work is merely to send the blood through the lungs. This is called the lesser or pulmonary circulation; the former is the greater or systemic circulation. The valves of the heart between the auricles and ventricles are membranes. There are three flaps on the right and two on the left side. On both sides they are attached to tendonous cords, and these in turn to muscles; by the contraction of the muscles the cords are held tense to prevent the valves from giving way under the pressure when the ventricles contract and from allowing the blood to pass back into the auricles. The beginnings of the pulmonary artery and the aorta are also guarded by bucket-shaped valves that close and prevent the return of blood to the heart as the latter is expanding. The walls of the arteries are very elastic and are put on a stretch when blood is forced into them from the left ventricle. Therefore they exert a steady pressure upon the blood by virtue of their elasticity, and the pulse which is felt in the arteries is lost in the capillaries and not felt in the veins. The veins have valves to aid in holding the blood from receding and to keep it moving toward the heart.

Heart′ wood. As the trunks of trees increase in diameter, new layers of wood are laid down each year upon the outside of the older wood. As the ascending sap moves along through the newer wood, it gradually abandons the older, more interior wood This wood gradually changes in character the most obvious feature usually being a change in color. The color of the heartwood differs in different trees, and gives the characteristic appearance to the various kinds of lumber. For example, walnut, oak or cherry lumber is recognized by and valued for the characteristic color of the heartwood of each.

Heat, a form of energy whose presence produces such sensations as those described by the words **cold, cool, warm, hot.** Two fundamental questions concerning the thermal condition of any body are the following: *What is its temperature?* and *How much heat does it contain?* But, before either of these can be answered, we must distinguish carefully between *heat* and *temperature* and learn how to measure each of these quantities.

TEMPERATURE

If two bodies, A and B, are placed side by side in contact, and B thereby gains heat and becomes warmer, be it ever so little, A has imparted heat to B; and A is said to have a higher temperature than B. But if we place B in contact with another body, C, and find that B thereby loses heat, we say that C is at a lower temperature than B. In general, difference in temperature between two bodies is that which determines which way the heat flows. Accordingly, Maxwell defines temperature as follows: "The temperature of a body is its thermal state with reference to its power of communicating heat to other bodies." An instrument which indicates temperatures is called a *thermometer*. See THERMOMETER.

TRANSFER OF HEAT

Having defined temperature as that which determines the direction of the flow of heat, we next consider the various modes by which heat is transferred or diffused. Of these only two methods are known, namely: Conduction and Radiation.

CONDUCTION

The former of these processes is familiar to everyone who has used a silver spoon in a cup of hot tea or in a plate of icecream; for in the one case the spoon evidently conducts heat from the tea to the hand and in the other case from the hand to the icecream.

Very little is known about the mechanism by which the particles of a solid body hand on heat from one to another. But experiment has shown that the rate at which heat flows through a solid depends upon four things only: the material of the bar; the length, l, of the bar; the area of cross-section, s; and the difference in temperature, θ, between the ends of the bar. We may summarize these facts by writing

$$\text{Rate of Flow of Heat}=\frac{K\theta S}{l},$$

where k is a constant depending upon the material of which the bar is composed. This is the fundamental equation of heat-conduction. In the case of fluids the equalization of temperature goes on much more rapidly than it otherwise would, on account of the mixing which is always going on automatically; the cooler and hence denser portions falling to the bottom of the containing vessel. This process of transferring heat from one part of a fluid to another is called *convection*. It is illustrated in the heat which is carried up the chimney. The mixing is a mechanical process; the transfer of heat takes place by conduction.

RADIATION

One of the earliest observations made after the discovery of the airpump was that both light and heat pass through a vacuum with the utmost ease. Even the perfect vacuum which exists between us and the sun is traversed every day by enormous amounts of heat. The process by which this transfer is made is called radiation. Numerous experiments show that radiant heat is reflected, refracted and polarized according to the same laws that light obeys and that light and heat are merely different kinds of radiant energy — alike except in wave-length. See LIGHT.

The fact that a body, when heated, emits exactly those kinds (wave-lengths) of radiant energy which the same body would absorb, if cool, is the foundation of the modern science of spectroscopy.

EFFECTS OF HEAT

Among the numerous effects of heat the most important probably are the following three: Change of dimension or change of stress; change of molecular state; and change of temperature.

Nearly all bodies increase in size when heated. Stretched rubber is an exception to this rule; and it is well known that water, when heated from 0°C to 4°C, diminishes in volume. The fraction of its length by which a solid changes its length when heated one degree Centigrade is known as its coëfficient of linear expansion.

The following table will show how the principal metals behave when heated:

COEFFICIENTS OF LINEAR EXPANSION

Glass	0.0000085
Platinum	0.0000085
Steel	0.000012
Brass	0.000018
Copper	0.000019
Aluminium	0.000023
Zinc	0.000029

It may be easily shown that the rate at which the volume of a solid changes with temperature is very exactly three times its coëfficient of linear expansion. Liquids can change, of course, only in volume. It is the volume-expansion of mercury that is employed in our ordinary thermometers. For the laws of expansion of gases see Charles' law and Boyle's law.

CHANGE OF MOLECULAR STATE

If a piece of cold ice have heat applied to it, the temperature of the ice will keep on increasing until a certain point is reached where it begins to melt. Then it is found to be impossible to change the temperature of the ice by applying heat to it; for all the heat applied goes to melt the ice into water *at the same temperature.* After the ice is all melted, the water can be changed in temperature until you reach its boiling-point. After that, all the heat applied is spent in converting the water into steam, *at the same temperature.* The same phenomenon happens in the case of nearly all solids and all liquids, provided the pressure remains constant while the heat is applied.

CHANGE OF TEMPERATURE

As everyone knows, the effect of heat is, in general, to increase the temperature of a body. Two exceptions to this rule, *melting* and *boiling*, we have just noted.

QUANTITY OF HEAT

The arbitrary unit of heat employed in physics is defined as *that quantity necessary to raise the temperature of one gram of water from 0° to 1° Centigrade.* This is called a *calorie.* It was early discovered that equal amounts of heat applied to equal masses of different substances do not produce the same rise in temperature.

The ratio between the amount of heat required to raise the temperature of any body one degree and that required to raise the temperature of an equal mass of water one degree is, accordingly, known as the specific heat of the substance. The amount of heat, H, required to heat a mass, m, from the temperature $t_1°$ to temperature $t_2°$, is described as follows:

$$H = m\,C\,(t_2° - t_1°) \text{ calories,}$$

where C is the specific heat of the substance. The amount of heat required just to melt one gram of a solid substance, *without changing its temperature,* is called the heat of fusion. This is the quantity which used to be known as latent heat. The heat of fusion of ice is 79 calories per gram. In a strictly analogous manner, experiment shows that it takes a definite amount of heat just to vaporize one gram of any liquid without changing the temperature. This quantity is called the heat of vaporization. To evaporate one gram of water without changing its temperature, 536 calories are required. For an account of the nature of heat and of the evidence for thinking heat a form of energy see THERMODYNAMICS and STEAM-ENGINE.

HENRY CREW.

Heat'ing and Ven'tila'tion, a branch of engineering dealing with the practical application of the laws of heat to the designing, construction and installation of apparatus for the warming and ventilation of buildings. Ventilation requires a regular and continuous change of air in a room in order to maintain the air at a required standard of purity, and is evidently intimately connected with the subject of heating. Practical systems of ventilation are always installed in connection with the heating system. The requirements of a heating system are that it shall be capable of maintaining a certain temperature in the space considered under all conditions of weather. In Europe the temperature demanded for living rooms is about 59° F. In the United States it is fully 10° higher. A heating system must consider, first, the production of the necessary heat as in a fireplace, a stove, a steam or hot-water boiler or in an electric radiator; second, the means of transmitting and diffusing the heat economically to the room which it is desired to heat. Stoves and fireplaces are placed in the rooms to be heated, and of course require no means of transmission. Steam and hot water may be transmitted in pipes to radiators in the rooms to be heated (direct radiation system), or the radiators may be placed at a convenient point and used to heat the air which is to pass into the rooms to be warmed (indirect radiation system).

The common hot-air furnace system is an indirect radiation system, in which the air is heated by contact with the iron walls of the furnace and then led by ducts through the house. In indirect systems the diffusion of the air may be by the tendency of hot and lighter air to rise or by some mechanical means as by fans and blowers. Fans and blowers are used in all successful indirect radiation methods of warming large buildings. The quantity of heat that must be produced depends mostly upon the losses in transmission through the walls and windows of the building and on the heat required to warm the fresh air required for ventilation. The losses in transmission and by conduction might be reduced to a very small quantity by construction, but healthy animal life requires a continual supply of fresh air. A common rule is to supply 30 cubic feet of fresh air per minute for each occupant of a room. In ordinary dwellings and in other buildings not occupied by large numbers, sufficient fresh air is ordinarily supplied by so-called natural ventilation, that is, by the ordinary drafts through doors, windows etc.; for buildings occupied by large numbers of persons, such as school-houses, theaters etc., some method of forced ventilation must be used. This may be done by drawing out the impure air (the aspirating system) or by forcing in fresh air by a blower (the plenum system). The latter method is much more successful. One of the advantages of indirect radiation systems is that the heating and the ventilation demands are both satisfied.

Of the three systems of heating by hot-air furnace, steam and hot water, the hot air is the least costly to install and the steam system next. Hot water requires more radiating surface, and hence costs from 25 to 30 per cent. more. In economy of fuel hot water is cheaper than steam, and steam in turn cheaper than the hot-air furnace. A direct radiation system is in general considerably cheaper to operate than the indirect, but costs more to install. Heating by electricity is very expensive, as not more than 4 or 5 per cent. of the heat of the fuel reappears as heat, but it may be advisable in certain cases on account of the convenience, as in street cars. The heat is produced by passing an electric current through iron or other metallic wires. The heating and ventilation industry is one of the largest in the world. Data of competent authorities place the annual expenditure in the United States at $50,000,000 or over.

Hebe (*hē'bē*) was the goddess of youth in ancient mythology — the daughter of Jove and Hera, who became the wife of Hercules after he was made a god. Until Ganymede succeeded her, she was cupbearer to the gods. She was supposed to have the power of restoring the aged to youth.

He'ber, Reginald, an English poet and second bishop of Calcutta, was born at Malpas, Cheshire, England, April 21, 1783. While a student at Oxford he produced the prize-poem of *Palestine*. He was a voluminous writer. His fame as a poet was gained by his *Palestine* and his *Hymns*, among the latter being *Lord of Mercy and of Might; Lo, He Comes in Clouds Descending;* and *From Greenland's Icy Mountains*. He died of apoplexy at Trichinopoly, April 3, 1826. See *Life* by Mrs. Heber.

He'brews. See Jews.

Hebrides (*hĕb'rĭ-dēz*) or **Western Islands,** the name applied, collectively, to the islands off the western coast of Scotland. Their total number is over 500, but hardly one fifth of them are inhabited. They are the scene of Scott's poem, *The Lord of the Isles*. See Buchanan's *Hebrid Isles*.

He'bron, one of the oldest Palestinian cities, belonging to the tribe of Judah, lies about 21 miles southwest of Jerusalem, in the valley of Eshcol, famous for fruit, and for seven years was the residence of King David.

Hec'ate, a goddess of Grecian mythology. There seem to have been various myths concerning her, some of them making her one of the Titans, honored by the Olympian divinities, whom she assisted against their enemies. But she was oftenest imagined to be one of the infernal deities and a being of mysterious and malign character. She was worshiped in fear, with gloomy sacrifices and magical rites.

Hec'la or **Hakla,** is a volcanic mountain in Iceland, standing alone, about 20 miles from the coast. It is 5,102 feet in height, and has five craters. There have been 18 eruptions from it since the 9th century, the last, in 1845, lasting over a year. In the eruption of 1783 the stream of lava was 45 miles long and 15 wide, the largest amount of lava thrown out at one time from a volcano.

Hec'tor, the ideal hero of the Trojans, was the son of King Priam and Hecuba, his second wife, and the husband of Andromache. Homer in his *Iliad* tells the story of his valor during the siege of Troy by the Greeks and of his death by the hand of Achilles, who dragged his body, attached by his feet to a war-chariot, around the walls of Troy.

Hecuba, (*hek'ū-bä*), the second wife of Priam, king of Troy. During the Trojan War she saw her husband and all but one of her sons killed. After the fall of Troy she fell into the hands of the Greeks as a slave, and, after suffering inhuman cruelties, threw herself into the sea. On this story Euripides founded one of his great tragedies, *Hecuba*.

Hedge'hog, an insect-eating animal, common in Europe, usually with the fur of the back and sides mixed with spines. It should not be confused with the porcupine of Canada and the United States, which is a much larger animal of a different family. The common hedgehog is about the size of a large rat, and other representatives of the family are smaller. They have a pointed snout, and feed on insects, mice and eggs. About 19 species are found in Great Britain, Europe and Asia. Some forms have no spines. Those with spines roll themselves into a ball when attacked.

Hedin, Sven Anders (*hĕ-dēn', svĕn än'-dĕrz*), a Swedish geographer and explorer, was born at Stockholm on Feb. 19, 1865, and educated there and at the Universities of Upsala, Berlin and Halle. In 1885 he explored Persia and Mesopotamia; in 1893–7 Central Asia from Russia to Pekin, through Tibet and the Lob-Nor region, a journey of harrowing adventure; and Central Asia again in 1899-1901. He is now exploring Tibet, and is reported to have recently discovered an unknown range of mountains there, 2,000 miles in extent. All of the great geographical societies regard his work as peculiarly valuable. He has published *Through Persia and Mesopotamia, King Oscar's Embassy to the Shah, Through Khorassan and Turkestan* and *Through Asia*, all of these being written in English, and *The Results to Geographic Science* in German.

Hegel (*hā'gel*), **Georg Wilhelm Friedrich,** was the last in a succession of the four great German writers who developed the philosophy of what is known as the ideal school; the other three being Kant, Fichte, and Schelling. Hegel was born in Stuttgart, Germany, Aug. 27, 1770, and was, with Schelling, educated at the University of Tübingen. In 1801 he published an essay on the philosophy of Fichte and that of Schelling, siding with the latter. Until 1806 he was at the University of Jena as licensed lecturer, then as professor extraordinary, and in the early part of that period joined Schelling in publishing *The Critical Journal of Philosophy*. Thus these two became so identified with each other that their works could hardly be distinguished one from the other, and it was not until 1807 that Hegel's *Phænomenology of Spirit* earned him personal distinction. He married in 1811, and in the following year published the first volume of *Logic*, his greatest work. In 1816 his growing fame as a writer earned him a professorship at Heidelberg, which he exchanged two years later for the chair of philosophy at Berlin, where he continued to teach until Nov. 14, 1831, when he died of cholera. During these years he wrote many books, the most noteworthy being *The Philosophy of Right.* After his death some of his friends published his complete works and lectures, among them being *Philosophy of Religion; Philosophy of Art; History of Philosophy;* and *Philosophy of History.*

Hegira (*hej'ĭ-rä*), **Hejra** or **Hijra** is an Arabic word meaning going away, and is commonly applied to the flight of Mohammed from Mecca, June 20, 622 A. D.

Heidelberg, (*hī'del-bĕrg'*), an ancient city of Baden, Germany. It lies 380 feet above sea-level, at the base of the Königsstuhl, 1,863 feet high, on the left bank of the Neckar. The city is celebrated for its university, founded by Rupert I in 1386, which flourished up to the era of the Thirty Years' War, when it declined until its restoration in 1802. It has courses in philosophy, law, medicine and theology, about 148 professors and 1,922 students. The library contains over 500,000 volumes and 4,700 manuscripts. Many of Germany's most famous scholars studied here. The city suffered by the Thirty Years' War: was taken by the French in 1689; and almost destroyed by them in 1693. Population 56,010.

Heine (*hī'ne*), **Heinrich,** was born of Jewish parents, at Düsseldorf, Germany, Dec. 13, 1799. At 16 he was sent to Frankfort to learn banking, but soon gave it up to commence trading on his own account, but failed. He studied law at the universities of Bonn, Berlin and Göttingen. In 1821 he brought out his first volume of *Sayings.* But the world only became aware that a poet of the first rank had risen, when in 1826 there appeared the first volume of *Travel-Pictures. The Book of Songs* was published next year, and caused the greatest excitement. These two works are Heine's masterpieces. His songs have the freshness and melody of a skylark's note. His being baptized a Christian in 1825 cost him the friendship of the stricter Jews, and his outspokenness in regard to the governments of the day kept him from obtaining a government office. His relatives were shrewd business men, who could see no virtue in being a poet, and the public censor condemned Heine's poems. So, dissatisfied with Germany, the poet went to Paris, where Thiers became his patron and the chief men then living at the capital his comrades. He at once turned from poetry to politics, playing the rôle of leader of the people. Heine was always an Ishmael, both in poetry and in politics — he would fight under nobody's flag but his own. In his writings he said many bitter things, and was always in hot water, but his love for men was warm and deep. He died at Paris, Feb. 17, 1856. See his *Life* by W. Sharp.

Heintzelman (*hīnt'sel-măn*), **Samuel Peter,** was born in Pennsylvania, Sept. 30, 1805; and died at Washington, D. C., May 1, 1880. He was a graduate of the United States Military Academy. He began his fighting career against the Indians, then served in the Mexican and Civil Wars, participating in the battles of Bull Run and Williamsburg and the siege of Richmond. He was retired in February, 1869, with the rank of major-general, by a special act of Congress.

Hel'en of Troy, one of the most beautiful women of ancient history. She was the daughter of Zeus and Leda and wife of the Spartan king, Menelaus. She was carried off by Theseus at the age of ten, but was recovered by her brothers, Castor and Pollux. Among all the Greek princes who paid her court, she chose Menelaus. Then Paris, the son of Priam of Troy, carried her off, and Menelaus, gathering all the Greeks about him, began the ten years' Trojan War. Upon the death of Paris she was married to his brother, Deiphobus, but betrayed him to Menelaus and returned with her husband to Sparta. Helen is the subject of story and poem by Vergil, Homer, Pausanias, Euripides and Goethe. See *Dream of Fair Women* by Tennyson and *Helen of Troy,* poem and essay by Lang.

Hel'ena, the capital of Montana, also is the county seat of Lewis and Clarke County. It is situated among the foothills of the Prickly Pear valley, near the base of the Rocky Mountains, about 14 miles from the Missouri River and 70 northeast of Butte. The surrounding country is both mineral and agricultural, and the city is principally made up of homes of cattlemen and miners. It is well-built, having good hotels and public buildings, chief among these being the government building, the state capitol and the county courthouse. Helena has excellent parish and public school systems, a high school costing $150,000, the Montana Wesleyan University, Saint Vincent's Academy and state and city libraries. There are several fine churches, Saint John's Hospital and St. Joseph's Orphanage. Marysville is the name of the largest mining-camp near the city, and four miles from Helena is the smelter of the American Smelting and Refining Company. The Missouri River Power Co., located on the river of this name, 12 miles from Helena, furnishes the city with electrical power for lighting, car-service and manufacturing. It has the service of the Northern Pacific and Great Northern railways. Population 12,515.

Helicon (*hĕl'ĭ-kŏn*), a mountain-range situated in the southwest of Bœotia. In ancient Greece it was the fabled resort of the Muses. The poet Hesiod lived at its foot, and on its slopes were the two fountains whose waters were held to give inspiration to the poet.

Hel'igoland is a small island about a mile long and one third of a mile wide, situated in the North Sea and belonging to Germany. It is peopled by 2,080 permanent residents, but is a great summer-resort. Its people live from the lobster-fisheries and from summer visitors. The island was conquered from the Danes in 1807 by Great Britain, and ceded to Germany in 1890. Since 1891 Heligoland has been attached to Schleswig-Holstein. See Black's *Heligoland.*

He'liograph, an instrument chiefly used in military operations in signaling messages from one station to another by means of a small mirror, which reflects to a distant point the rays of the sun cast upon it. The instrument is simple and portable, and when used is made to send messages to a distant point by the use of long and short flashes, thus spelling out words and sentences by the use of the dot-and-dash or Morse alphabet. The essential difference between messages by the heliograph and by the ordinary telegraph "sounder" is that in the first case the message is read by sight and across the distance at the station *sending* the same, and in the latter by sound and at the station to which it is *sent.*

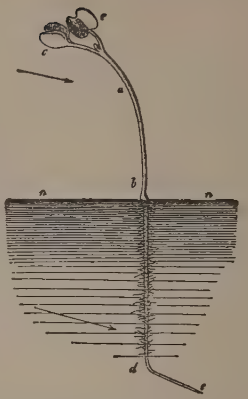
Heliopolis (*hē-lĭ-ŏp'ō-lĭs*) (city of the sun), one of the most ancient and important Egyptian cities, stood on the Pelusiac branch of the Nile. The obelisk now standing in Central Park, in New York, was first brought from this city to Alexandria. Heliopolis was the great seat of learning in ancient Egypt.

He'liotax'is (in plants). See PHOTOTAXIS.

He'liotrope the common name of species of the genus *Heliotropium,* which contains about 115 species widely distributed in warm regions, nearly 15 of which occur in North America. They are recognized by their spreading and one-sided clusters of flowers, which in the cultivated forms have a characteristic fragrance. The forms of cultivation are probably all derived from two species, the leading one being *H. Peruvianum,* native to Peru. The other species is *H. corymbosum,* also from Peru. The original color of both of these species is violet, but the colors of cultivation are various shades of purple to white.

Heliotrope or **Bloodstone** is a variety of chalcedony or jasper. It is found in almost all parts of the world, but the finest specimens are brought from Asia.

Heliot'ropism (in plants) is the sensitiveness of a plant to a change in the direction of light, to which it responds by placing its organs again in a definite position with respect to it. In many plants this is accomplished by a change in the rate of growth of some part, producing curvature and carrying attached parts into the new position. Thus, if a geranium plant be taken from a greenhouse and set before a window, the leaves are carried into a position facing the window by curvature of their stalks. This is the usual response of leaves of this kind, while radial leaves, as those of the onion, direct their tips toward the light. Some stems bend so as to direct the apex toward the light, and some roots turn away from it. Other plants accomplish like changes by means of the motor organs (which see), in which changes of turgor (which see) produce the curvatures that move the attached parts.



A young plant of mustard grown in water, showing heliotropic curvature caused by one-sided illumination. *n, n,* level of water; *b,* older part of stem; *a,* younger part where curvature occurs; *c, c,* primary leaves; *d,* sharp curve of root; *e,* the growing point. The arrows show the direction of the light.

He'lium. See ARGON.

Hel'lespont. See DARDANELLES.

Hell Gate is a pass in East River between Long Island and New York, for a long time dangerous to the passage of vessels, but in 1885 the obstruction was removed by blasting. See BLASTING.

Hell'muth, Right Rev. Isaac, was born near Warsaw, Poland, in 1820, of Jewish extraction. Educated at the University of Breslau, in 1841 he made a public profession of Christianity, and came to Canada in 1844. Ordained by the Bishop of Quebec in 1846, he was a professor in the University of Bishop's College, Lenoxville, for eight years. Later he became archdeacon, dean of Huron and rector of St. Paul's Cathedral, London (Ontario). He was elected coadjutor-bishop of the diocese of Huron, and made bishop with the title of Bishop of Norfolk. The same year he succeeded Bishop Cronyn, who died in 1871. His most enduring work was education. With Bishop Cronyn he established Huron Theological College (1863), Hellmuth Boys' College (1865) and Hellmuth Ladies' College (1869). He aided in establishing Western University, contributing largely to it from his private funds. These institutions are all doing excellent work at the present time. While they flourish, he will never need a monument. His son, Isidore Hellmuth, is a graduate of Cambridge, and practices law in Toronto. Bishop Hellmuth died in 1901.

Helm'holtz, Herman Ludwig Ferdinand von, the most distinguished physicist of the 19th century, was born at Potsdam, Prussia, August 31, 1821, and died at Charlottenburg, near Berlin, Sept. 8, 1894. He was educated at the Military Medical School at Berlin. Having taken his degree in medicine in 1842, he remained an army-surgeon until 1847, when he published his remarkable paper *On the Conservation of Energy.* This paper, which, perhaps, more than any other has dominated physical science during half a century, was refused publication by *Poggendorff's Annalen*, the leading physical journal of the world. It was published by the Physical Society of Berlin, July 23, 1847.

In 1849 he became professor of physiology and pathology at the University of Königsberg. In 1855 he accepted the chair of anatomy and physiology at Bonn and, three years later, the chair of physiology at Heidelberg. It was at the latter place that he prepared those two monumental volumes, *The Sensations of Tone* (1862) and *Physiological Optics* (1866). In 1871 he was called to Berlin as professor of physics. This university at once became headquarters for physical investigation, a position which it maintained for a quarter of a century. In 1888 Helmholtz was called to the directorship of the great National Physical laboratory at Charlottenburg, where he remained until his death in 1894. His investigations in hydrodynamics and geometry are of the first rank, and make him almost equally distinguished as physiologist, physicist and mathematician,

He'lotism (in plants). Two different kinds of plants have often learned to live together in such an intimate way, that they are usually found together. For example, a lichen is not a single plant, but it consists of an alga and a fungus living together. This general habit of living together in an intimate relationship is called symbiosis, and that form of it in which one plant is thought to enslave the other, that is to maintain it so that the former may live upon its products, is called helotism, the reference being to the Greek slaves of ancient times, who were called helots. Some think that the lichen is a case of helotism, the fungus having enslaved the alga. See SYMBIOSIS.

He'lots. See SPARTA.

Helvetii (*hel-vē'shĭ-ī*), a people of Celtic origin, so says Cæsar, who inhabited what is now western Switzerland. The chief event in their history was their attempt to migrate to southern Gaul, in which they were driven back with frightful slaughter by Cæsar in 58 B. C. Of 368,000 who left their homes, only 110,000 returned, and these became subject to Rome. The story is told in Cæsar's lifelike way in his *Commentaries.*

He'ly-Hu'tchinson, Hon. Sir Walter Francis, G. C. M. G., military secretary to Lord Milner and governor and commander-in-chief of Cape Colony since 1891, was born in Dublin, Ireland, Aug. 22, 1849, the second son of the fourth Earl of Donoughmore. He was educated at Harrow and at Trinity College, Cambridge. His colonial service has been long, varied and distinguished. In 1893 he inaugurated responsible government in Natal, being governor of Natal and Zululand from 1893 to 1901. During his term he carried out the annexation of the Trans-Pongola territories, now a part of Zululand, and was special commissioner for Amatongaland.

Hem'ans, Felicia Dorothea, an English poet, was born at Liverpool, England, Sept. 25, 1793. Her maiden name was Browne, and she married Captain Hemans in 1812. After the birth of five sons Mrs. Hemans separated from her husband, and from that time (1818) engaged chiefly in literary work. Her poetry is distinguished by grace and felicity of expression, often by great tenderness, especially in her simpler and less ambitious efforts. Her works include *Early Blossoms*, *The Domestic Affections*, *The Forest Sanctuary*, *Records of Women*, *Songs of the Affections* etc. Americans know her best for the poem entitled *The Landing of the Pilgrims.* She died near Dublin, Ireland, May 16, 1835.

Hem'lock, a family of plants having small white flowers and a flattened, oval fruit. The best known and most important species is the common or spotted hemlock, growing by the wayside and on heaps of rubbish in all parts of Europe and Asia and now naturalized in America. It has a small root, resembling a parsnip, a bright green, hollow stem, two to five feet high and generally spotted with purple. The leaves are large, of a dark shiny green. The chief ingredient of the hemlock is an alkaline poison, causing weakness and staggering gait and finally paralysis and death. The leaves and fruit are used as a medicine, obtained by distilling or by drying and crushing to powder. Among the Greeks death by hemlock poisoning was the punishment usually meted out to criminals, and so Socrates died.

Hemlock, an evergreen tree of much grace and beauty. It grows in temperate North America, Japan, Central and Western China and the Himalayas. There are seven species. The trees are tall and pryamidal in shape, the bark furrowed and reddish, the branches slender and often pendulous, feathery, plume-like. The Canadian hemlock is found in upland forests and along rocky river-banks from Nova Scotia to eastern Minnesota and along the Appalachians to northern Alabama; it is an important forest-tree in the east and is at its best on the mountain slopes of North Carolina and Tennessee. It grows from 60 to 70, sometimes to 100 feet high. In the spring it is all alight with the yellow-green of its new leaves, which turn darker with age. The cones, which droop from the branches, are small and solitary. It is frequently planted as an ornamental tree, but is especially beautiful in the forest. With the growing scarcity of pine, hemlock has come to be used extensively as lumber though it is of inferior quality. The bark is extensively used in tanning leather. See Sargent's *Manual of Trees of North America.*

HEMLOCK

Hemp, the fibrous bark of several species of plants, the common hemp being *Cannabis savtia*, a member of the nettle family. This species is probably native to central Asia, but is widely cultivated. It also occurs in many places as a strong-growing weed. Forms in cultivation have received various names, but all are derived from the single wild species. They are tall, rough and strong-smelling plants, with leaves palmately cleft into five or seven coarse-toothed leaflets, and are easily recognized. The Manila hemp is obtained from a species of *Musa* (*M. textilis*), the genus to which the banana belongs. The cultivation of this fiber banana is confined almost entirely to the Philippines, where it is grown in very dense and extensive groves, the plants reaching a height of 20 feet or more. The sisal hemp is obtained from a species of agave (*A. rigida*), which is largely grown in Yucatan as a fiber, thrives on the Florida Keys, and is used in the United States for making shipcordage.

HEMP

Henderson, Ky., the capital of Henderson County, on the Ohio River, a little south of Evansville, Ind., in the northwestern part of Kentucky. It is 144 miles west-southwest of Louisville, on the Louisville and Nashville, Louisville, St. Louis and Texas and Ohio Valley railroads. It has extensive woolen and cotton mills, tobacco-stemming, carriage and wagon manufactories, distilleries and car-works. It manufactures foundry-products, agricultural implements, furniture, flour etc. It has good schools, a number of churches and a sanitarium. The city owns its lighting plants and waterworks. Population 11,452.

Hen'dricks, Thomas Andrews, vice-president of the United States, 1885, was born near Zanesville, O., Sept. 7, 1819, and admitted to the bar of Indiana in 1843. He served successively as state legislator, congressman, United States senator and governor of Indiana. In 1876 he was the Democratic candidate for vice-president. In 1884 he was elected to the vice-presidency. He died at Indianapolis on Nov. 25, 1885. See *Life* by Hensel.

Hengist (*hĕn'gĭst*) and **Horsa,** the names of two brothers who led the first successful Teutonic invasion of Britain. Hengist is said to have conquered the whole of Kent. He is supposed to have died about 488 A. D.

Hen'nepin, Louis, a Franciscan explorer, was born at Ath, Belgium, about 1640. As a Franciscan he preached for some time at Halles, Belgium. He was chaplain of a regiment at the battle of Senef (1674) between the Prince of Condé and William of Orange. The next year he was ordered to Canada, and sailed with Bishop Laval and La Salle. For a while he preached in Quebec, then went to the Indian mission at Frontenac (Kingston, Ontario), and made a trip into the Mohawk country. In 1679 he joined La Salle's expedition. The *Griffin* was built, and the company sailed through Lakes Erie, Huron and Michigan to the mouth of the St. Joseph River. This they went up in canoes, carrying them five or six miles over the portage to the Kankakee, down which they floated, as, also, down the Iroquois to the Illinois. On the banks of the Illinois they built Fort Crévecœur, near where Peoria now stands. Hennepin was now sent with two others on a voyage of discovery, and was charged to meet La Salle at the mouth of the Wisconsin. Father Hennepin set out in a canoe, followed the Illinois to its mouth, and then explored the Mississippi till the party were captured by a band of Sioux and taken up the river to their villages. They were rescued from the Indians by Daniel Greysolon, who had made peace with the tribe, and carried back to Lake Michigan. While a captive, Father Hennepin discovered and named the falls of St. Anthony. He next sailed for France, where he published his *Description of Louisiana.* His last work, *New Journey in a Country Greater than Europe,* went through 24 editions in various languages. The date of Hennepin's death, which occurred in the Netherlands, is about 1703. See Spark's *Life of La Salle* in the Library of American Biography.

Henry I, king of England (surnamed *Beauclerc* or fine scholar), was the youngest son of William the Conqueror and the only one born in England. Tradition says he was born at Selby, Yorkshire, in 1068. After aiding his brother, Robert, to defend his domains in Normandy, he captured the royal treasury in England and, on the death of his brother, William Rufus, was elected king. He married Eadgyth (afterward called Matilda), the daughter of Malcolm of Scotland and Queen Margaret. His reign was successful, but often marked by cold-blooded cruelties. He was called the Lion of Justice. He died in 1135, and was succeeded by Stephen. See *Norman Conquest* by Freeman, and *Constitutional History of England* by Stubbs.

Henry II of England was the son of Matilda by her second husband, Geoffrey Plantagenet. Born at Le Mans, France, March 5, 1133 and succeeding Stephen by treaty, he was crowned on Dec. 19, 1154. His principal object in government was to make the church subservient to the state, but after a long struggle with Becket, once his prime minister and afterward a churchman, he was only partially successful. In 1173 his two sons, Henry and Richard, counseled by their mother, led a rebellion against him, and after partial defeat, he died at Chinon July 6, 1189. He ranks among the greatest of English kings.

Henry III of England was the son of King John, and was born on Oct. 1, 1207, succeeded his father in 1216, and died in 1272. He was a weak man, unfit to be king, but English freedom owes much to his unfitness and weakness, for the first real house of commons originated in 1265, when the boroughs first sent deputies to parliament, as the shires or counties had already sent knights. Simon de Montfort, Earl of Leicester, was the champion of *Magna Charta* and the people against the king. Henry's reign was exceeded in length only by those of George III (58 years) and Victoria (63 years). He was succeeded by his great son, Edward I.

Henry IV of England, the first king of the house of Lancaster, was born on April 3, 1366, and surnamed Bolingbroke from his birthplace. In 1385 he was made earl of Derby, and married Mary de Bohun. He led a roving life for some years, was present at the taking of Tunis in 1390, fought against the heathen on the shores of the Baltic and attempted to reach Jerusalem. In 1397 he supported Richard II against Gloucester. and in the following year was banished, Upon the death of his father his estates were forfeited. In July, 1399, he landed in York with three small vessels, and on September 29 he obtained from Richard, then a prisoner in the Tower, an abandonment of his claims to the throne. On the next day Henry arose in parliament and claimed kingdom and crown. His reign proved one of trouble, disorder and rebellion. Poverty and heavy taxes oppressed the people, and Henry's dependency on the wealth of the church caused him to allow severe laws against heretics to be made. In 1412 he sent two expeditions into France, but his closing years were a miserable succession of epileptic fits, in one of which he died at Westminster on March 20, 1413. See Gairdner's *The Houses of Lancaster and York* and Wylie's *History of England under Henry the Fourth.* See also Shakespeare's *King Richard II* and *King Henry IV.*

Henry V of England, the oldest son of Henry IV, was born on Aug. 19, 1387. He inherited his mother's good qualities and a soldierly disposition from his father. He was engaged against Glendower, the Welsh patriot, in 1401, and in 1403 he was wounded by an arrow at Shrewsbury. He was king's lieutenant in Wales until 1408, in 1409 constable of Dover and in 1410 captain of Calais. He was crowned on April 9, 1413. The great effort of his reign was the attempted conquest of France. On Aug. 11, 1415, he sailed for France with 10,000 men, captured Harfleur after a five weeks' siege, and proceeded toward Calais. On his way, at Agincourt, he was blocked by the French army, over which, on Oct. 25, he gained a victory against such odds as to make it one of the most notable in history. Two years later he again invaded France, and at the end of 1418 Normandy was in possession of the English crown. On May 21, 1420, the perpetual peace of Troyes was concluded, and Henry was made regent and heir of France, receiving in marriage Catherine, the youngest daughter of the king. He returned to England, but the news of the defeat of his brother, the Duke of Clarence, at Beaujé recalled him to France for the third time. He was meeting with his usual success at arms, when he was seized by sickness and died at Vincennes, Aug. 31, 1422, at the age of 35. He was religious, just and pure of life; a brave soldier and a brilliant general. In wisdom and solid policy he was inferior to many of his ancestors. See Gairdner's *Houses of Lancaster and York;* Nicolas's *History of the Battle of Agincourt;* A. J. Church's *Henry the Fifth;* Shakespeare's *Henry V.*

Henry VI of England, only son of Henry V, was born on Dec. 6, 1421, became king when eight months old, though he was not crowned until 1429, and died on May 21, 1471. He was gentle, pious, well-intentioned and weak. During his reign Joan of Arc caused the redemption of all France, except Calais, from the English; and the civil war, known as the War of the Roses, broke out and raged in England. This cost Henry his throne and the life of his son and heir. It also destroyed the ancient nobility and ended feudalism. Henry deserves permanent remembrance and regard as the founder of Eton College and of King's College, Cambridge.

Henry VII of England, the founder of the Tudor line, was born on Jan. 28, 1456. He was next in right of succession to Richard III, after the death of Richard's nephews. After the battle of Tewkesbury Henry fled to Brittany, and there remained until invited to invade England and overthrow Richard. His first attempt ended in failure, but in August, 1485, he landed at Milford Haven, marched across the country, and met Richard in battle at Bosworth, where the usurper was slain. He now ascended the throne, and his marriage with Elizabeth of York, whereby the red and white roses were united, took place in the following January. In 1492 he led an invasion into France, but the payment of 750,000 crowns bought him from his purpose — indeed, his reign was marked by never-ending effort to secure wealth, for when he died on April 22, 1509, he left a fortune which would now be worth $90,000,000. Yet he was considered an excellent ruler, an able and subtle politician and a successful diplomat. Like Henry IV, however, he acknowledged that he owed his throne to the people and their parliament. Bacon speaks of him as "a wonder for wise men." See Gairdner's *Henry the Seventh.*

Henry VIII of England, the second son of Henry VII, was born in 1491. Through his mother, Elizabeth of York, he united the rival claims of the houses of York and Lancaster. The death of his older brother made him heir to the throne, and he was betrothed to his brother's widow, Catherine of Aragon. He became king in 1509, and was very popular with his people during the first half of his reign. He was the most English of all English kings and the handsomest prince of his times. He had personal qualities that bound to him very strongly such men as More, Wolsey and Thomas Cromwell. For 20 years he was governed by his prime minister, Wolsey, whose intention was to give England importance by acting as an arbiter between Spain and France. In this period took place the meeting of the French and English kings on the field of the Cloth of Gold, the battle of Pavia and the sack of Rome. The fall of Wolsey was the result of his opposition to Henry's plan of divorcing his wife, Catherine of Aragon, to open the way for his marriage with a new favorite, Anne Boleyn. The pope refused his sanction, and Henry, whose reply to Luther had won him from Pope Leo X the title of Defender of the Faith, brought about the separation of England from Rome, making himself head of the church in England. The final breach of England with Rome came about in 1534. Henry's quarrel was with the pope, and not with the Catholic church, and he treated with equal severity the clergy of the old church and the new followers of Luther. In 1536 Anne Boleyn was executed in the Tower, and the day before the execution Henry married Jane Seymour, who died leaving one son, Edward VI. His fourth marriage was a political one, brought about by his minister, Thomas Cromwell, for the sake of gaining the Protestant interest of Germany. But Anne of Cleves failed to win the regard of the king and was divorced, carrying down Cromwell, who was executed for treason. Henry's fifth wife was Catharine Howard, who in less than a year suffered the same fate as Anne Boleyn, in her case deservedly. Henry's sixth wife was Catharine Parr, who had the good fortune to survive her husband. Henry died at Westminster, Jan. 28, 1547, unhonored and unmourned. The tyranny that had shown itself in his home-life had grown with his exercise of power, till no man's life was safe who thwarted him. The names of his victims, Wolsey, Cromwell, More, Surrey and Fisher, prove him to have been uninfluenced either by gratitude or merit. But he loved his people, and held England firmly to the path of progress. See *History of England* by Froude; *Lectures on Mediæval and Modern History* by Stubbs; and *Reign of Henry VIII* by Brewer.

Henry II of France, was born on March 31, 1519, married to Catharine de Medici in 1533, and succeeded his father, Francis I, in 1547. He captured Calais from the English during his invasion against her in connection with the Guises. In 1559 he was wounded by a Scotchman when off his guard in a tournament, and died of his injuries on July 10.

Henry III of France, the third son of Henry II and Catharine de Medici, was born on Sept. 19, 1551. He was zealous in the Catholic cause, taking part in the massacre of St. Bartholomew. Through the intriguing of his mother he was elected to the throne of Poland, but, hearing of his brother Charles' death, he fled to France and succeeded him (1574). The incessant wars between the Huguenots and Catholics were features of his reign; but his time was given to riotous excesses and outbreaks of religious fanaticism. He was stabbed by a Dominican friar, Jacques Clement, on Aug. 2, 1589, and died the next day. See M. W. Freer's *Henry III, His Court and Times.*

Henry IV of France and Navarre, surnamed The Great and The Good, was born in 1553 at Pau, France. In 1569 his mother, fearing that he would be abducted to Spain and raised in the Catholic faith, carried him to Rochelle and placed him in charge of the Huguenot army, at whose head he fought the battle of Jarnac. In 1572 he was married to the French king's sister, Margaret of Valois, but within a week the massacre of St. Bartholomew occurred, and he was spared only on condition of professing Catholicism. Having done this, he was for three years held in reality a prisoner at the court of France, but in 1576 he escaped and rejoined the Huguenot army. However, on the death of Henry III, his right of succession was disputed, and he determined by force of arms to gain his rights; but it was not until he had formally professed himself a member of the church of Rome in 1593 that he was crowned in the next year, though he had ostensibly been king since 1589. Peace was not concluded until some years later (1598), when he signed the famous Edict of Nantes, giving liberty of worship to Protestants. After 19 unsuccessful attempts on his life, he was on the 14th of May, 1610, assassinated by a fanatic named Ravaillac. Henry IV is by many held to be the greatest as well as the most really French of all the kings of France. See M. W. Freer's *History of the Reign of Henry IV*.

Henry IV, emperor of Germany, was born on Nov. 11, 1050, elected king in 1054, and succeeded his father in 1056, his mother acting as regent. As with most of the monarchs of his time, his chief struggles were with and on account of the church. When he began to rule in 1070, all were arrayed against him — people, nobles, church and state, and his life was spent in continual warfare. His son, Conrad, was induced by Pope Pascal II to revolt, and Henry was imprisoned by Conrad. He escaped to Liege, and there died on Aug. 7, 1106.

Henry, called The Lion (born 1129, died 1195), Duke of Saxony and Bavaria, was the son of Henry the Proud and the head of the Guelphs. Bavaria had been taken from his father, but was restored to Henry the Lion in 1154, making him the most powerful noble in Germany, his dominions stretching from the North Sea and the Baltic to the shores of the Adriatic. His great power caused many princes to band against him in 1166, but he was able to hold his ground against his enemies, even when the German emperor, Frederick I, placed him under the ban of the empire. Henry's rule was an enlightened one. He encouraged farming and trade, fostered the commerce of Hamburg and Lübeck, and was the founder of Munich.

Henry the Navigator, a famous Portuguese prince, the fourth son of King João I, was born at Oporto in 1394. After the death of his father he took up his residence at Sagres, near Cape St. Vincent, and, while carrying on the war against the Moors, his sailors reached parts of the ocean never sailed before. His great ambition was to discover new worlds, and it was he who, single-handed, pushed Portugal into an unprecedented career of discovery. He erected an observatory and naval school at Sagres, and sent some of his pupils on voyages which resulted in the discovery of the Madeira Islands in 1418. Then he turned his attention to the Gold Coast of Guinea, and in 1442 one of his mariners sailed around Cape Nun and took possession as far as Cape Bojador. Next year a larger ship sailed 120 miles farther, and in 1440 Cape Blanco was reached. In 1446 his captain, Nuno Tristram, doubled Cape Verd, and in 1448. Gonzalez Vallo discovered three of the Azores. Henry died at Sagres, Portugal, Nov. 13, 1460. See Major's *Life of Prince Henry*.

Henry, Joseph, the foremost American physicist during the middle of the 19th century, was born at Albany, N. Y., Dec. 17, 1797, and died at Washington, D. C., May 13, 1878. Having completed his academic education at Albany, he began to study medicine, but shortly changed his mind and began teaching mathematics and physics at Albany Academy. In 1832 he was elected professor of physics in Princeton College, a position which he filled with distinction until 1846, when he resigned to accept the secretaryship of the then new Smithsonian Institution in Washington. His most important achievements perhaps, are the following:

1 He showed how electro-magnets should be wound, and how cells should be joined into batteries to produce the largest possible effect at the distant end of a long line of wire, a problem whose solution was absolutely essential to successful telegraphy.

2. He extended Faraday's results by showing that, not only does a primary current induce a secondary, but this secondary produces a tertiary in the same sense as the primary, etc.

3. He was the first to observe the oscillatory discharge of the Leyden jar, a phenomenon now employed daily in wireless telegraphy.

4. His investigations of the acoustical principles involved in the transmission of fog-signals and in the construction of large lecture-rooms are of the first order.

Henry, Patrick, one of the greatest orators of America, was born on May 29, 1736, in Hanover County, Va. After failing as a storekeeper and farmer, he became a lawyer. He acquired prominence by his defense against an unpopular tax-levy. He was a delegate to the first Continental

Congress at Philadelphia in 1774, and delivered its first speech. In 1776 he carried the vote of Virginia for independence, became governor of the state, and was four times re-elected. In 1795 he declined the secretaryship of state, which Washington offered him. He died in Virginia, June 6, 1799. See his *Life* by William Wirt.

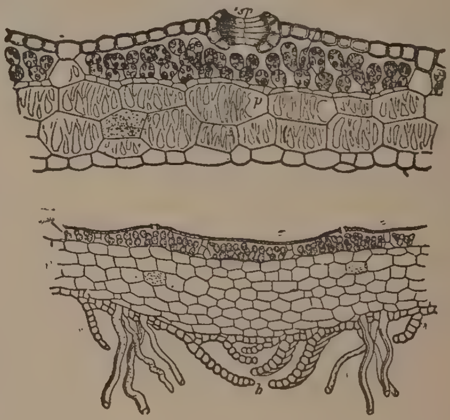
Hen'schel, George, born Feb. 18, 1850, at Breslau, Germany, is a composer, conductor and singer. He studied in Leipsic Conservatory and in Berlin under Kill and Schulze. His vocal and instrumental compositions are numerous, including some large works as well as shorter pieces. In 1881 he was appointed first conductor of the Boston Symphony Concerts, and in 1885–6 he assumed the same position with the London Symphony Concerts. For a time he succeeded Mme. Goldschmidt as professor of singing at the Royal College of Music, London.

Hen'ty, George Alfred, a prolific writer of juvenile stories, was born at Trumpington, England, Dec. 8, 1832. He was educated at Westminster School and at Cambridge, and served during the Crimean War and afterwards in Italy and England. Later he was correspondent for the London *Standard* in the Austro-Italian and Franco-German wars and the Abyssinian and Ashanti expeditions. He wrote *With Clive in India; In Freedom's Cause; Under Drake's Flag;* and stories of adventure, mostly for juvenile readers. He died on Nov. 16, 1902.

Hepatica (*he-pat'-i-ca*), a very early and well-beloved spring flower, color pinkish-blue or white, member of the crowfoot family. The blossoms come before the leaves, well-adapted for their early advent by a fuzzy covering about buds and stems; they are delicately fragrant, grow solitary on a long scape, and consist of six or more colored speals. The leaves are mottled with purple, grow from the root, and toward the base are heart-shaped. From the shape of the leaf the plant is sometimes known as liver-leaf. The leaves become leathery and thick, remaining green all winter. The hepatica grows on fringe of woods and in open pasture, is common in the eastern states, and grows westward to Minnesota and Missouri. It is a contemporary of the arbutus, truly a "brave little wilding."

Hepat'icæ. Plants which form one of the two great divisions of bryophytes and are commonly known as liverworts. They occur in a variety of conditions, some floating on the water, many on damp soil and rocks and many on the trunks of trees. The form most commonly seen (*marchantia*) is a flat green body (thallus) prostrate on damp soil or rocks, especially dripping cliffs. This prostrate habit gives a dorsiventral body, that is, one whose two sides are differently exposed and hence develop differently. In marchantia the upper or dorsal surface develops chlorophyll and those structures connected with the work of chlorophyll, while the under or ventral surface is not green, but puts out numerous hair-like processes ("rhizoids") which lay hold of the substratum and act as anchoring and absorbing organs. On the upper surface of this liverwort and in some others little cup-like bodies (cupules) are often seen, which contain small reproductive bodies ("gemmæ"). At certain times vertical branches arise which bear the sex organs (antheridia and archegonia). Thi-green thallus body, therefore, is the gametophyte. When the sexual spore (oöspore), produced in the archegonium by fertilization, germinates, it does not produce another thallus-body, but a more or less stalked spore-case full of asexual spores, among which are the curious "elaters" (which see). This spore-case, therefore, is the sporophyte, and when its spores germinate they produce the green thallus-body or gametophyte. This is a good illustration of alternation of generations (which see). There are three great liverwort lines: (1) Marchantiales, with thick bodies and even outlines, except for the dichotomous branching; (2) jungermanniales or "leafy liverworts," so named because the thin body is broken into two rows of close-set leaves and resembles a delicate moss; (3) anthocerotales, in which the thin body bears a

Marchantia, showing the antheridial branch rising from the thallus body.



HEPATICÆ
Sections of Marchantia, showing chlorophyll tissue (*chl*), air-pore (*sp*), and rhizoids (*h*).

very peculiar spore-case (see anthoceros). The second of these lines contains by far the greatest number of species, many of which are associated with mosses and lichens in covering tree-trunks and are commonly mistaken for mosses. The liverworts are of special interest from the fact that they probably have been derived from the algæ, and in turn have given rise to the mosses and ferns. J. M. COULTER.

Hep′hæstus. See VULCAN.

Heptarchy (*hĕp′tȧrk-ȳ*), the name sometimes applied to the seven kingdoms supposed to have been established by the Saxons in England. It is a misleading term, an error, unless the chief kingdoms at different periods be meant. The chief kingdoms at different times between the 5th and 9th centuries were Wessex, Sussex, Kent, Essex, East Anglia, Mercia and Northumbria.

Hera or **Here** (*hē′rē*). One of the names of Juno. In the Roman mythology she was queen of heaven and wife of Jupiter. She presided over womanhood, maternity and chaste wedlock and very young children. She was also imagined to have supervision over the public finances and justice. Hera is the Greek and Juno is the Latin name for the same person. See JUNO.

Her′aldry, in the sense most commonly used, is the knowledge of the laws that regulate armorial bearings, that is, the devices that appear on shields, their crests, supporters and badges. The custom of using a coat-of-arms may be traced to very early times, as to the standards of the twelve tribes of Israel, of the Egyptians and the Roman eagle. From these times grew up the custom of clans and families distinguishing themselves from others by signs and emblems. After a while it was considered the right of all noblemen to use a coat-of-arms, no two families being allowed to use the same. A coat-of-arms is composed of a shield or escutcheon on which the charges or emblems are depicted. Often the charges used bore some relation to the names or residence of the user, and, in the case of rulers, the arms of the country or countries over which he presided. See Boutell's *Heraldry, Historical and Practical.*

Herat (*hĕr-ät′*), capital of the most westerly of the three divisions of Afghanistan, lies on the Heri-Rud River, 2,500 feet above sea-level. It is a strongly fortified city, and the citadel is occupied by a British garrison. It is one of the most important markets of central Asia, and lies in a district famous for rich crops and excellent fruits. Herat is the military and political key to central Asia, having for a long time been a bone of contention between England and Russia. In 1890 it was planned to connect it by a railroad with India, but the project has as yet not been carried out. Its exports are indigo, dried fruits, dyes, asafœtida, rice, wool, carpets, raw hides, silk and leather wares; while chintzes, cloth, sugar, ironware and European wares are imported. Its population changes from time to time, and averages about 50,000. See Malleson's *Herat.*

Her′bart, Johann Friedrich, a noted German philosopher and educator, was born at Oldenburg in 1776, and died in 1841. He studied under the idealist Fichte, and, after teaching philosophy during 1805–9 in the University of Göttingen, was called to the chair which the great Immanuel Kant had filled for so long at Königsberg. Herbart returned to Göttingen to teach during the eight years previous to his death. His interests were divided between philosophy, psychology and education; or rather, these three studies for Herbart involved one another. As a philosopher, Herbart was a realist. He rejected the idealism of Fichte and Schelling, and tried to work out the theory of the nature of the real *being*, underlying change, at which Kant had only hinted. Beneke and Lotze were in some sense disciples of Herbart. As an educator, Herbart was not immediately popular, but his ideas were taken up, elaborated and popularized by a vigorous and efficient school, which included the names of Ziller, Story, Dorpfeld, Staude and Rein. The Herbartian principles of education have had a very beneficent influence in England and America. A Herbart Society was founded in the United States in 1889. Through its agency the chief educational works of Herbart were translated into English, so that his name and ideas were soon in the mouths of all teachers. The chief works of Herbart upon education are the *General Pedagogy Deduced from the End of Education* (1804) and the *Outlines of Pedagogical Lectures* (1835). The dates show over how long a range of his life Herbart was occupied with education.

Herbart agrees with other educators, and indeed few other educators have insisted with such force, that character is the one end of education. Knowledge is a means to the good character. Herbart perhaps errs in attributing good character almost entirely to ideas, so that he might almost say with Socrates, that virtue *is* knowledge. But it was well for him to emphasize the moral import in all knowledge. There is a danger, however, that the Herbartian teacher may rely upon instruction alone to form the good character. Herbart thinks that morality is the necessary consequence of mental balance or of a many-sided interest. Accordingly, Herbart and his followers have demonstrated in great detail the importance of the place of *interest* in education. To understand fully the teaching of Herbart upon interest and upon the interrelation and *correlation* of studies, it is needful to make a study of his psychology and, perhaps, even his metaphysic. According to the psychology of Herbart, the mind is a system of masses of ideas, which combine mathematically together in the process of assimilation or *apperception.* Correlation of studies strengthens the masses of ideas, while these masses of ideas in their turn give rise to interests, and these to the will and character. The psychology of Herbart does indeed give a valuable account of the process of the association of ideas; but without allowing sufficiently for heredity or original mental tendencies and unities. Out of the description which Herbart has given of the nature of the mental process in apperception there has come the formal method of instruction by four steps: clearness, association, system and method. *Clearness* has been subdivided into the preparation and presentation of the subject-matter which is to be taught.

Her'bert, George, an English poet, born on April 3, 1593, in Wales. Of an extremely modest disposition, he was most beloved by all who knew him for his good and almost saintly life. He was called Holy George Herbert. His *Country Parson* and *The Temple* are perhaps the best known and most beautiful of his works. Such lines as "Sweet day, so calm, so cool, so bright, the bridal of the earth and sky" were not born to die. He died near Salisbury in 1633. See *Life* by Izaak Walton.

Herbert, Victor, a grandson of the novelist Samuel Lover, was born in Dublin, Ireland, in 1859, but has lived for the most part abroad and in America since 1886. He is a prominent composer, bandmaster and conductor. He has been chief violincellist in the Court Orchestra at Stuttgart, solo violincellist in the Metropolitan Orchestra of New York, conductor of the New York 22nd Regiment Band and conductor of the Pittsburg Orchestra. He has written a number of comic operas, including *Prince Ananias*, *The Wizard of the Nile*, *The Serenade*, *Cyrano de Bergerac* and *The Idol's Eye;* also an oratorio, *The Captive.*

Herculaneum (*hĕr'kū-lā'nē-ŭm*), a city of Italy, formerly situated at the base of Mt. Vesuvius, by the eruption of which it was seriously injured in 69 A. D. and totally buried in 73 A. D. It now lies from 40 to 100 feet below the surface. In 1706 some relics were found, but no systematic excavations were undertaken until 1738, when what was supposed to have been the theater was uncovered and many beautiful statues and pictures taken from it. Of late years excavations have been again undertaken, and many art treasures from the entombed city now repose in the National Museum at Naples. The Italian government is now pushing excavation with renewed vigor.

Hercules (*hĕr'kū-lēz*), the son of Zeus and Alcmene of Thebes. Incurring the wrath of Hera, the wife of Zeus, he was made to serve Eurystheus, who enjoined upon him the performance of many difficult tasks. Thus he became to the Greeks the type of manly strength and manly endurance. The poets differ as to the number and character of the tasks set before him, but they are generally supposed to have been twelve, called the twelve labors of Hercules. The manner of his death is uncertain, although the story was that the poisoned robe of Nessus sent him by his wife so crazed him that he threw himself upon the funeral pyre of Mt. Œta, and was carried to Olympus, the heaven of the Greeks.

Hercules, Pillars of. See GIBRALTAR.

Her'der, Johann Gottfried von, one of the profoundest of German writers, equally well-known as philosopher, theologian and critic, was born on Aug. 25, 1744. He was essentially a poet of and for the people, translating legends and songs from Arabian, Spanish and old German poets, besides being a writer on all topics of deep and independent thinking. His greatest work, although left incomplete, was *Outlines of a Philosophy of a History of Man.* He died at Weimar, Dec. 18, 1803. See H. Nevinson's *Herder and His Times.*

Here. See HERA and JUNO.

Hered'ity, the transmission of physical and mental likeness from parent to offspring. It is a matter of everyday observation that the offspring is like the parent, and it raises this question: Why is this likeness transmitted; and how does the offspring inherit the peculiarities of parents? These questions are very difficult and have not been fully answered. Darwin supposed that in the chick, for example, minute particles, which he called gemmules, came from every part of the body and united in the egg, so that, when the young bird began its existence in the egg, there were little particles in that egg derived from every part of the parent animal, and traits and peculiarities were inherited through this channel. This is called the theory of pangenesis. Weismann's explanation has the advantage of being simpler. He points to the fact that the particular parts that connect one generation with another are the egg-cell and the sperm. He looks upon the many cells forming the body as a sort of vehicle to carry the germ-cells or those from which new life is produced. These structures, of course, are composed of protoplasm, and it has been discovered that within the nucleus of all animal-cells are located minute bodies that stain more deeply than the rest of the protoplasm and are therefore called chromosomes. These chromosomes are of the same number in all cells of the body of any particular animal, and they are supposed to be the particular parts of the living substance that carry the traits or qualities that are inherited. By a complicated process the chromosomes are equally divided whenever cells undergo division, and produce new cells. Before developing, the egg, which is derived from the maternal source, becomes united with the sperm from the paternal source, and, therefore, the fertilized egg contains elements derived from each parent. As the fertilized egg divides, there is each time an equal division of the chromatic material derived from these two sources. It follows, therefore, that every cell must contain some of the identical substance that entered into the body of both parents. This substance is in the chromosome and is the bearer of hereditary traits.

Her'kimer, Nicholas, an intrepid soldier of the Revolution, was born in New York state about 1715 of German parents. His life was spent on a farm, with few educational advantages, until the call to arms. He fought with daring, leading an expedition successfully against Sir John Johnson's force in 1776. He then marched to the relief of Fort Schuyler, and during the siege was wounded in the leg. A careless operation cost the soldier his life. He died in August, 1777. A monument to the hero of Oriskany has been erected on the battlefield, chiefly through the instrumentality of the Oneida Historical Society.

Her'mes. See MERCURY.

Her'mit, a name applied to one who, desiring to be removed from all the cares and temptations of life, withdraws from the world and lives alone in some cavern or hut. The first hermit is said to have been Paul of the Thebaïd (Egypt), who fled to the desert and there died at the age of 113 years. His most famous imitator was St. Anthony. The name is now applied to those who withdraw not only from religious motives, but from aversion to society or from love of solitude.

Her'mon, Mt. (now called Jebel-es-Sheikh), a mountain or range of mountains of the Anti-Libanus range, 9,150 feet high. See LEBANON.

He'ro and Lean'der. Hero was a priestess of Aphrodite at Sestos. Leander met Hero at a festival, became enamored and thereafter used to swim every night from his home across the Hellespont to see her, guided by the light that shone from her tower. Venturing to make the passage one stormy night, he was drowned, and his body was washed up to the tower where Hero was stationed. Upon seeing the lifeless form of her lover, Hero plunged into the water that she might join him in death. The story is related in the work of Musæus and in Ovid. Both have been represented in works of the later artists.

Her'od Agrippa I, the son of Aristobulus, brother to Herodias and grandson of that Herod the Great who reigned in Judea when Christ was born. He was educated at Rome, and received from Caligula the tetrarchate of Judea with the title of king; and after the banishment of Herod Antipas he was given all the old provinces of Judea. He was popular with the Jews, and much praised for his vigorous measures against the growing sect known as Christians. It was he who caused the apostle James the Greater to be beheaded and had St. Peter thrown into prison.

Herod (*hĕr'ŭd*) **the Great** was the second son of Antipater, whom Cæsar appointed procurator of Judea in 47 B. C. When Herod was 15, he was made governor of Galilee and later, with his brother, a joint tetrarch of Judea. He was displaced, forced to flee to Rome, where he pressed his claims, again made tetrarch of Judea, and afterwards (40 B. C.) was proclaimed king of Judea, with considerable added territory. His reign was marked by the most atrocious cruelties and fearful butcheries, among them the putting to death of his wife, Mariamne, and their two sons. He died in the year of Christ's birth, after reigning 37 years. See *History of the Jews* by Ewald.

Herodotus (*hē-rŏd'ō-tŭs*), commonly called the Father of History, was born between 490 and 484 B. C. at Halicarnassus, a Greek colony on the shores of Asia Minor. On account of wars and dissensions he began traveling, and covered an immense territory in his wanderings, and afterwards wrote the histories of the wars through which he passed and of many of the countries he visited. There is no authentic record that he lived after 425 B. C. The best English translation of his works is by Rawlinson.

Her'on, a long-legged water-bird found all over the world except in the coldest regions. North America is the poorest in species and South America the richest. These birds have a long, loose plumage and, among the ordinary feathers, tracts or patches of downy feathers that break into powder as they grow. The number of these patches of powder-down is used to distinguish the different groups; there are three such patches in the true herons. These birds stand perfectly motionless in the water watching for fish, frogs and other animals which they strike with great swiftness with their long, strong bills They also at times eat meadow-mice, slugs, snakes and insects, but they never get very plump, no matter how abundant their food. They are wary and difficult to approach. The great blue heron, wrongly called blue crane, the largest heron in North America, is a beautiful and very interesting bird; seeing one in its native haunt is an event to be remembered. When standing fairly erect, it reaches over three feet in height;

with wings closed its general color above is bluish-gray, the under part white with black markings on the side. It has plumes on the head, neck and back. It breeds throughout North America, nesting in large trees in impassable swamps. The smallest heron is the little green heron, quite common in timbered and well-watered regions.

HERON

The black-crowned night-heron nests in very large colonies. It is a southern bird, but breeds as far north as Massachusetts. As its name suggests, it is abroad at night, and feeds and flies by night. The little blue heron is a southern bird but wanders north in summer.

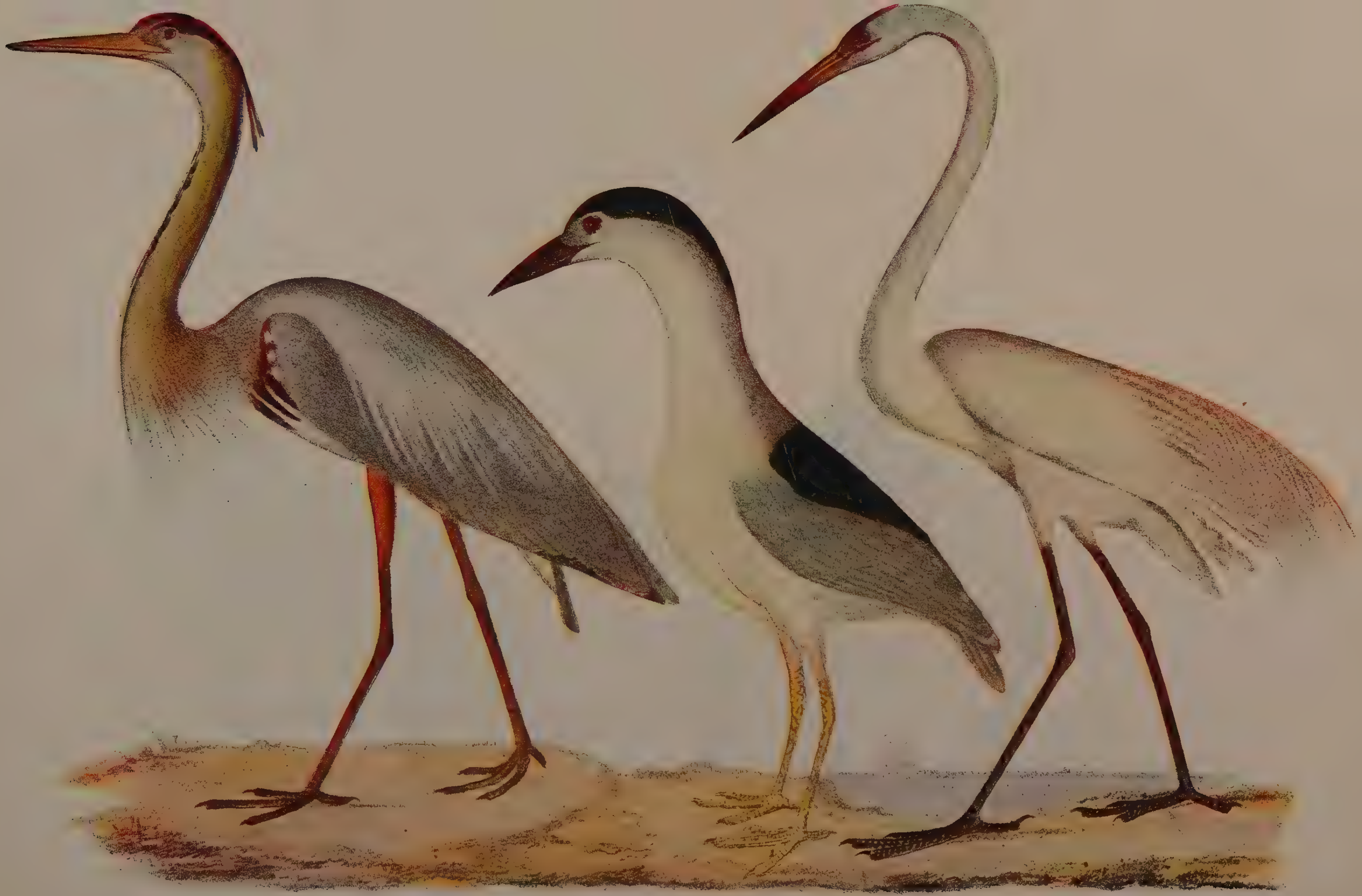
The plumes of the snowy heron or snowy egret have been its undoing, this wonderfully beautiful bird being another victim to the vanity of women and the greed of milliners. Once very abundant about the everglades of Florida, this bird was slain by the thousands during the nesting season and is now very rare in the United States.

Her′rick, Robert an English poet, was born in 1591 in London. The next year his father died, and he was bound for ten years as apprentice to his uncle, a goldsmith. In 1613 he was a fellow at St. John's, writing to his uncle letters for remittances. He took his degree in 1620, returned to London, and became the friend of Ben Jonson and his jolly acquaintances. In 1629 his mother died, and he took orders, only to be appointed to a poor living where he bemoaned his fate. His volumes embrace about 1,200 poems, among them the *Mad Maid's Song;* the *Night Piece to Julia;* and *To the Virgins.* He died in October, 1674. See *Seventeenth-Century Studies*, by Edmund Gosse.

Her′ring, a common, small, salt-water fish. It occurs in immense numbers, is easily captured, and is extensively known in the form of smoked herring. There are about 130 species found in all seas; many forms ascend rivers to spawn. The alewife and the shad belong to the herring family. The name is also given to a fresh-water fish, which resembles the marine herring in form, but belongs to quite a different family, viz., the whitefish family.

Herschel, Sir Frederick William, generally known as Sir William Herschel, a distinguished astronomer, was born at Hannover on Nov. 15, 1738, and died in England on Aug. 25, 1822. Herschel began his life as a musician. In 1756 he went to England and spent some years at Bath as a teacher of music. Meanwhile, all his spare time was devoted to grinding lenses, making telescopes and studying the heavens. In this work he was aided by his brother and sister. In 1781 he discovered a new planet, to which he gave the Latin name of *Georgium Sidus*, but which we now call Uranus. It probably was chiefly due to this discovery that he was called by King George III to be his private astronomer, This enabled him to lay aside his musical profession and devote himself to astronomy. He was permanently established at Slough near Windsor, and there spent the remainder of his life. Some of his more important contributions to science were a series of papers concerning the rotation of the planets and their satellites; the discovery of Uranus; extensive catalogues of double stars; memorable memoirs on the *Motion of the Solar System in Space* (1783-1818); the completion (1789) of his great reflecting telescope of 40 feet focal length and 4 feet aperture; and the discovery of the sixth and seventh satellites of Saturn in 1787 and 1789 respectively.

Herschel, Sir John Frederick William, the illustrious astronomer, only son of Sir F. William Herschel, was born at Slough, England, March 7, 1792, and died on May 11, 1871. He was educated at Cambridge, and in 1820 began his astronomical work, under the guidance of his father. In 1833 appeared his memoirs *On the Investigation of the Orbits of Revolving Double Stars.* To his father's long list of double stars, which he re-examined, he added many more of his own discovering. His next step was a thorough examination of the southern heavens. For this purpose he transported his instruments and family to the Cape of Good Hope in 1834. His *Cape Observations*, published in 1847, include a catalogue of the southern stars and nebulæ, careful drawings and charts, a catalogue of double stars with descriptions of their orbits, etc. Herschel remained four years at the Cape, returning to England in 1838. He later gave considerable



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GROUP OF HERONS

Great Blue Heron. Night Heron. Great White Heron.

attention to the then new science of photography. He was the first to use glass as a support for the sensitive film; and to him we owe the terms "positive" and "negative" as used in photography. He is buried in Westminster Abbey near the grave of Newton.

Hertz, Heinrich Rudolf, a brilliant German electrician, born at Hamburg, Feb. 22, 1857, died at Bonn, Jan. 1, 1894. Having abandoned his early intention of being an engineer, he entered Berlin University in 1878. Helmholtz at once recognized the remarkable abilities which he displayed in the line of physics, and immediately assigned him the problem of finding to what extent electricity exhibited inertia. The solution which Hertz found for this problem (1880) is his first important piece of work. In 1880 he was appointed assistant in the physical laboratory at Berlin. In 1885 he accepted the chair of physics in the engineering school at Carlsruhe. It was in this laboratory, in 1888, that he completed his immortal work on the connection between light and electricity. Maxwell, interpreting Faraday, had prophesied on purely mathematical grounds that electrical forces are propagated through space according to the same laws and the same speed as light. To prove or disprove by experiment this prediction of Maxwell's was suggested by Helmholtz as a prize question for the Berlin Academy of Sciences. This is the problem which Hertz solved in 1888, thereby confirming Maxwell's views and making it highly probable that light is nothing but electricity in vibration. While at Carlsruhe, he married Miss Elizabeth Doll, a daughter of one of his colleagues. In the spring of 1889 he received a call from the University of Bonn, which he accepted. Here he remained until his too early death. The last monument of his genius is his *Principles of Mechanics*, a volume upon which he worked during the last three years of his life and which was published posthumously. This profound work is understood by very few people. See also his *Electric Waves* and *Miscellaneous Papers*, both of which have been translated into English. The best account of his genial and lovable character is to be found in the prefaces and introductions to his works, partly by Helmholtz and partly made up of Hertz's letters to his family.

Her'vey Islands. See COOK ISLANDS.

Hesiod (*hē'sĭ-ŭd*), one of the earliest Greek didactic poets, was born at Ascra at the foot of Mt. Helicon. His era is that of 735 B. C. or so. He wrote *Works and Days* and the *Theogony*.

Hesperides (*hĕs-pĕr'ĭ-dēz*), the name of the sisters who guarded the golden apples given by Gæa to Hera upon her marriage with Zeus. Their genealogy and number are a matter of dispute. The gardens of the Hesperides were thought to be in the far west, on the shore of the ocean. The apples were stolen by Hercules and restored by Athena.

Hesse (*hĕs'*), or **Hesse-Darmstadt,** a grand duchy of the German empire. It is separated into two division by a strip of Hesse-Nassau. The principal rivers are the Rhine, which divides two of its provinces, the Main and the Neckar. Mainz (91,124), Worms (43,841), Offenbach (59,806) and the capital, Darmstadt (83,385) are the principal cities. There are a university at Giessen and one at Darmstadt. Hesse yields iron, manganese ore and peat, and its industries are mainly the making of leather boots, fine upholstery, tobacco, cigars, chemicals etc. Its total population is 1,282,219. It was founded by an ancient German tribe and governed independently until acquired by Prussia. Ancient Hesse was divided in 1567 among the four sons of the landgrave, Philip, and in 1604 two of the branches became extinct, and it was formed into Hesse-Cassel and Hesse-Darmstadt. Its area, including Upper and Rhenish Hesse and Starkenburg, is close upon 3,000 square miles.

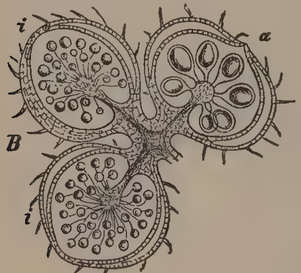
Hes'sian Fly a two-winged insect associated in a family with gall-gnats, wheat midge etc. These are minute insects, but their larvæ have caused more extensive damage to the wheat crop than any other insect. The eggs hatch into a very small flattened maggot of a pale red color; these crawl into a joint, near the base of the wheat-stem, just where a leaf fits into the stalk, burrow into the stem, and sap its life and vigor. They pass into a pupa-stage and are known as flaxseeds. There are two or three broods a year. This fly received its name from the belief that they were brought to the United States by the Hessian troops during the War of the Revolution. It has been active ever since Revolutionary days, but some years have been years of especial disaster, as 1789, 1817, 1846, 1863, 1873, 1876 and some succeeding periods. It is combated by burning the stubble of wheat-fields, as the pupa lives over winter. See *Third Report*, U. S. Entomological Commission 1880-82.

HESSIAN FLY

Hes'tia, the Greek goddess of the hearth and home. Hestia was the oldest daughter of Cronos and Rhea, and, having been wooed by Poseidon and Apollo, vowed eternal virginity in order to free herself from their suit. She is not mentioned in Homer, and is consequently believed to be of later origin than the rest of the great Grecian deities. She was regarded as the personification of home and private life, as opposed to Hermes who represented business and outdoor life. She is sometimes spoken of as the sacred fire itself, which was kept constantly burning and used to light the hearth-fire of a newly founded colony. It was believed to presage great disaster should this sacred fire of Hestia ever become extinguished.

Het′erocyst (in plants). Among the blue-green algæ (*cyanophyceæ*) certain forms, as nostoc, consist of chains of cells. Here and there in the chain occur cells which are colorless and larger than the ordinary cells, and whose work is not known. These are called heterocysts, a name which simply means other cells.

Heterogamy (*hĕt′ẽr-ŏg′ȧ-mȳ̆*), a condition in plants in which the sexual cells (gametes) are unlike, that is, they have become distinguishable as male and female and are called sperms and eggs. All but the lowest plants are heterogamous. When heterogamy appears, not only do the gametes differ, but the organs which produce them are unlike, antheridia forming sperms and oögonia or archegonia forming eggs. The contrasting term is homogamy or isogamy, meaning gametes similar.



HETEROSPORY

A group of three sporangia, one being a megasporangium containing megaspores, and two being microsporangia containing microspores.

Heterospory (*he′ter-ŏs′pŏ-rȳ̆*) (in plants). In the lower plants the numerous asexual spores which each individual produces are usually alike. Among the pteridophytes, however, certain forms (some ferns and club-mosses) produce asexual spores which differ very much in size. The small ones are called microspores, the large ones megaspores. These two kinds of spores are developed in different spore cases (sporangia), which are hence called microsporangia (those which produce microspores), and megasporangia (those which produce megaspores). When the microspores germinate, they produce very small gametophytes which bear only antheridia (male organs) and hence are called male gametophytes. When the megaspores germinate, they produce larger gametophytes, which bear only archegonia (female organs) and hence are called female gametophytes. Heterospory is very important among plants, for its appearance is the first step toward the appearance of seeds. All seed-plants (spermatophytes) are heterosporous. The pollen sacs of flowers are microsporangia, and the pollen grains are microspores. The ovules are megasporangia, and each ovule contains but one megasporangium, which has been called the embryo-sac. The peculiarity about this large solitary megaspore is that it is never discharged by its sporangium (the ovule), but is retained and germinates within the ovule. It is this condition which results in a seed and gives the chief character to seed plants. The contrasting term is homospory or isospory, indicating that the asexual spores are similar. Thallophytes, bryophytes and most pteridophytes are homosporous; some pteridophytes and all spermatophytes are heterosporous. J. M. COULTER.

Hewlett (*hū̆′lĕt*) **Maurice Henry,** an English barrister and, from 1896 to 1900, Keeper of the Land-Revenue Records and Enrolments, is known as perhaps the most sympathetic interpreter of mediæval thought in all the annals of modern romance. Mr. Hewlett was born in London in 1861, and was called to the bar in 1891. In addition to a number of short stories of high merit, he is the author of *The Masque of Dead Florentines*, *The Forest Lovers* (which in 1898 attracted widespread attention), *Little Novels of Italy*, *Richard Yea-and-Nay*, *The New Canterbury Tales*, *The Queen's Quair*, *The Road in Tuscany* and *The Stooping Lady*.

Hezeki′ah ("May Jehovah strengthen him"), a king of Judah, who reigned from 728 to 697 B. C. During this time occurred the invasion of Judea by the Assyrians under Sennacherib, when 180,000 of the Assyrians died in one night. (See *II. Kings* xviii–xx and *II. Chron.* xxix–xxxii.) Hezekiah executed many great works, among them the aqueducts of Jerusalem.

Hiawatha (*hī′ȧ-wa′thȧ*). This well-known poem of Longfellow's was composed in 1855, in the prime of the poet's life, and may be regarded as on the whole his masterpiece. It is based on a legend current among the Iroquois tribes, which deal with a hero known to them as Hiawatha but bearing other names among other Indian peoples. Perhaps no such person existed, but the legend asserts that he sought to unite the ever-warring tribes in a bond of peace and to encourage intercommunication by forest-roads and rivers. The Iroquois themselves were attempting this task when the white men came, so that Hiawatha's splendid efforts and his failure appealed to them. An account of the myth is given in *Algic Researches* (1839) and *The Myth of Hiawatha* (1856) by Schoolcraft. Longfellow took his material from the former work; the delightful, though somewhat monotonous meter as well as the general plan of the poem he borrowed from the ancient epic of Finland, *Kalevala*. But this indebtedness must not blind us to the singular merit of Longfellow's work.

The introduction is a beautiful appeal to the reader to appreciate the simple Indian tale, lay aside racial prejudice and delight in the life of nature in which the story moves. The plan of the story is simple, but at first reading may escape notice. The Indians are to be tested. A prophet will appear among them with power to lead them in a life of peace and industry. If they fail to receive and follow him, they are doomed to extinction. This message the Great Spirit descends from heaven to deliver, having assembled the chiefs of all the tribes. The prophet, Hiawatha, is miraculously born, his father being the west wind. He exhibits his strength in a contest with his father, in which he would revenge the wrong his mother had suffered. Then he gives the Indians of the east the benefits that would enable them to become a single, happy and numerous people. He gives them corn to take the place of hunting, opens the river-courses and forest-paths, with the aid of "the very strong man, Kwasind," and teaches them gentler feelings through the music of his friend, the musician, Chibiabos. He invented the canoe and slew the serpents and the great magician who brought disease and death to men. In his marriage to Minnehaha he united east and west, Iroquois and Dacotah, and by teaching picture-writing he made records possible and treaties and communications between distant places. He gained them relief from expensive honors for the dead. But his enemies were too strong for him; the treacherous ice killed Chibiabos, sloth and sleep slew Kwasind, gambling brought depravity and disunion among his people, famine and cold stole from him his beloved wife. Then the white man's ships were seen, and the black-robed priest landed to preach a new gospel. Hiawatha bade his people always treat the white man as his own guests, and then in his canoe sailed away to the west and was never seen again. For he knew that his mission had failed and must fail.

Besides the charm and power of the narrative, the poem is marked by a sweetness of diction hardly surpassed. The Indian names of common things are exceedingly appropriate and beautiful, and the poet introduces them with great effect. His descriptions of the phenomena of nature are brief and full of life. The very monotony of the verse not only makes the reading easy and rapid, but it renders all the more striking occasional variations, as: "*clear and limpid from the footprints Of the Master of Life descending*." or, "*speechless in his infinite sorrow*."

Hi'bernation is a torpid state in which certain animals pass the cold months of the winter. It is to be noted that in hot countries there are animals which pass the summer in a similar condition. In such a state animals scarcely breathe; and the presence of life is shown by the action of the heart alone. Thus a hibernating animal may be kept under water unharmed during a period which would normally be more than sufficient to cause its death. The temperature of an hibernating animal is almost that of the things which surround it. Only the muscles seem to gain in excitability; for the lightest touch may excite most abrupt movements. Hibernation perhaps is merely an intense sleep of long duration, for it may exist in all sorts of degrees. Only a few mammals, including bears, skunks, dormice and prairie-dogs, will hibernate; but reptiles do so freely, as do some fishes. Many snails rest entirely in their shells, almost dried up, but protected by layers of membrane from exposure to the air, during the entire duration of summer. Bats not only hibernate, but during the day rest in a sleep akin to hibernation. Hibernating animals consume their own tissues, although slowly; and when they awake it is to a considerable loss of weight and a keen feeling of hunger.

Hick'ory, the species of the genus *Hicoria* formerly called *Carya*, well-known trees of the walnut family. There are about ten species, and all occur in eastern North America. The nuts are mostly edible; but although they have been used ever since the discovery of America, they have never been properly cultivated and improved. The nuts are mostly gathered from wild trees, although lately orchards containing improved varieties have been planted. The common nuts of the market are the pecan (*H. pecan*); the shag-bark hickory (*H. ovata*), with its small nut; and the big shell-bark hickory (*H. laciniosa*), with its large thick-shelled nuts. The pecan-nut is a southern species of hickory found on the border of streams from Iowa and southern Illinois and Indiana to Louisiana and Texas and also in Mississippi and Alabama. Texas provides a large part of the pecans of commerce, but various southern states are now paying attention to the cultivation of the tree. It is the largest of the hickories, rises to a height of from eighty to a hundred feet and above, grows rapidly, its fruit a smooth, thin-shelled brown nut highly valued for its sweetness and flavor.

Hicks-Beach, Rt. Hon. Sir Michael Edwards, Bart., M. P., P. C., D. C. L., English statesman, was born in London, Eng., in 1837, educated at Eton and Christ Church.

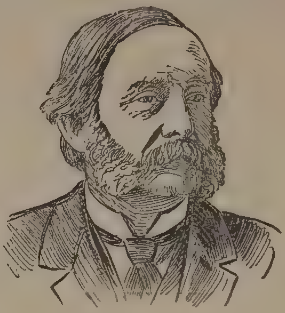
Oxford, and in 1864 became a member of Parliament. During the first ten years of his political life, when his party (the Conservatives) were out of power, Sir Michael filled subordinate posts, as secretary to the Poor Law Board and under-secretary for the Home Department. In 1874, when the Conservatives gained office, he was appointed Chief Secretary for Ireland, and three years later he was admitted to a seat in the cabinet. From 1878 to 1880 he acted as Secretary of State for the Colonies. He went out of office with his party. When Lord Salisbury succeeded to power, in 1885, he was appointed Chancellor of the Exchequer and became leader in the house of commons. He resigned with his party in February, 1886, when Gladstone and the Liberals gained power for a few months, but in August of that year he took office once more under Salisbury, becoming Chief Secretary for Ireland. This post he resigned in March, 1887, when he was succeeded by Balfour. He served a second time as chancellor of exchequer (1895 to 1902), and he has subsequently acted on various committees of the house and repeatedly acted on important arbitrations. Nominally, he is a free trader, but has favored Balfour's proposals for retaliation, while he has condemned financial extravagance. In 1905 he was created Viscount St. Aldwyn.

Hick'sites. See QUAKERS.

Hides, the commercial term for skins of the larger animals, as domestic cattle or horses, and of bison, buffaloes etc. The term always means the skin before it has been made into leather. Hides appear as an article of commerce either "green," dried or salted, and are used almost exclusively for manufacturing into leather. The hides of smaller animals, as sheep, goats, deer etc. are known as "skins."

Hieroglyph'ics, the name given to various kinds of picture-writing, but chiefly to that of the ancient Egyptians. Hieroglyphs, the characters used, had their origin in the want of an alphabet in times when spelling by means of specific characters — letters — was unknown. Emblematic writing, the attempt to represent an object by making a picture of it, the picture being after a time made always in the same way and becoming a hieroglyph, is the origin of all alphabets. Hieroglyphics among the Egyptians had gone far toward what we call a written language when the inscriptions now deciphered by scholars were made. Symbols formed the syllables of a word or the letters that spelled a word. Many of the ancient people wrote with hieroglyphics, the most prominent instance of the kind in America being the picture-writing of the ancient Mexicans, by which they depicted, rather than wrote of, the affairs of common life.

Hig'ginson, Thomas Wentworth, an American author, essayist and lecturer, was born at Cambridge, Mass., Dec. 22, 1823. He graduated from Harvard and entered the ministry, but abandoned it in 1858. He was an active antislavery agitator, and in the Civil War was the commander of the first regiment made up of former slaves. Among his books are *Outdoor Papers; Harvard Memorial Biographies; Army Life in a Black Regiment; Young Folk's History of the United States; Short Studies of American Authors; Poems and Translations; Larger History of the United States; Old Cambridge;* and *Contemporaries.* Higginson's *Collected Writings,* appeared in 1900. He died May 9, 1911.



THOMAS W. HIGGINSON

Hil'dreth, Richard, an American writer, was born at Deerfield, Mass., June 22, 1807. He graduated at Harvard in 1826, was admitted to the bar in 1832, and became editor of the Boston *Atlas.* He was an early resident of Florida, where in 1837 he wrote *Archy Moore,* an antislavery tale, later republished as *The White Slave.* Among his works are *History of Banks; Despotism in America,* an antislavery work; *Theory of Morals* and *Theory of Politics.* His greatest literary task, however, was his *History of the United States* He died at Florence, Italy, July 11, 1865.

Hill, Ambrose Powell, a Confederate general, was born in Culpeper County, Va., Nov. 9, 1825. He served in the Mexican and Seminole Wars. In 1861 he joined the Confederate army, becoming successively colonel, brigadier-general and major-general. He was in the battles of Bull Run, Cedar Mountain, Antietam, Chancellorsville and Petersburg. He received the surrender of Harper's Ferry, and at Chancellorsville succeeded to the command after the death of Jackson. He was in command of a corps in the army of northern Virginia, when at the battle of Petersburg on April 2, 1865, he was killed.

Hill, Benjamin Harvey, an American statesman, was born in Georgia on Sept. 14, 1823. He became distinguished as a lawyer, and in 1861 was elected to the Confederate senate, where he served until the close of the war. He ably served his state and section during the reconstruction period, being elected to Congress in 1875 and to the United States senate in 1877. He died at Atlanta, Ga., Aug. 19, 1882.

Hill, Daniel Harvey, an American general, was born in South Carolina on July 12, 1821, graduated at West Point in 1842, and served through the Mexican War. In 1859 he became president of the military institute at Charlotte, Va. At the beginning of the Civil War he entered the Confederate service, and was made colonel of the 1st North Carolina volunteers. He rose to the rank of major-general, and remained in the service until the surrender of Johnston's army. After the close of the war he returned to Charlotte, N. C., and became the publisher of *Field and Farm* and, later, of *The Land We Love.* General Hill was the author of *Elements of Algebra*, *The Crucifixion of Christ* and *Consideration of the Sermon on the Mount.* He died at Charlotte, N. C., Sept. 24, 1889.

Hill, James Jerome. In 1856 there arrived in St. Paul, Minn., then a frontier village, an 18-year-old boy from Canada. Born in Guelph, Ontario, Sept. 16, 1838, of well-to-do Scotch-Irish parents, James J. Hill was to have been educated for the medical profession. A lover of nature and books, he was thought unfitted for a business career. His father's death gave to the United States the man who was to win the nickname of Colossus of Roads.

JAMES JEROME HILL

Here briefly are the steps in his education for his great work as a railroad empire builder. Notice how each step grew out of the other:

FROM CLERK TO RAILROAD PRESIDENT

1. Nine years (1856-1865) as clerk for a Mississippi Steamboat Company, during which he studied the transportation and fuel situation.
2. Became agent (1865) of a Steamboat line.
3. Went (1867) into the general transportation and fuel business.
4. Began his railroad experience as station agent of the only railroad then entering St. Paul.
5. Formed a fuel and warehousing firm.
6. Organized (1870) Red River Transportation Company, to carry on trade between U. S. and Manitoba.
7. Established (1872) first regular through transportation service between St. Paul and Winnipeg (then Ft. Gary).

BEGINNING OF THE RAILROAD EMPIRE

8. With three associates bought (1878) defaulted bonds of the St. Paul and Pacific Railroad Company which had built some lines in Minnesota, and owed nearly $33,000,000. Almost no one except Mr. Hill believed in its future. He did, because he believed in the future of the country. After acquiring its bonds he joined the fragments of the road into something like a system and connected it with the Canadian Government line to Winnipeg.
9. Organized (1879) St. Paul, Minneapolis and Manitoba Railroad Company to take over all these properties and build on them as a foundation. The system grew rapidly with the country.

THE GREAT NORTHERN SYSTEM

10. Mr. Hill saw early that the line must ultimately reach the Coast and, without a pause, conceived, financed and built, in spite of all difficulties, the magnificent system now called the Great Northern. Very few, at the time, appreciated the immense resources of the country through which it passes. The system was made independent in its eastern connections by the establishment of a steamship company on the lakes and on the west by the establishment of a steamship line to the Orient. By subsequent extensions and connections, the Great Northern System has grown to 7,800 miles. It has never passed a dividend and its credit has always stood high in the most disastrous times.

THE MAN BEHIND IT ALL

The motive power behind it all was James J. Hill. His great principles of management — and notice that they all are principles that apply to any line of business — are: economy of operation, low grades and easy curves, powerful engines and cars of large capacity; adjustment of traffic so as to reduce the haul of empty cars to the minimum. He has made a special study of scientific agriculture and, through numerous addresses and by practical work on the farms of the Northwest, has led the movement for better methods. His *Highways of Progress* deals profoundly with national development. He is a tireless reader, a generous giver for educational purposes and although nominally withdrawn from active business life, his touch is felt by all his great enterprises. He was made an LL.D. by Yale in 1910.

Hills'boro, Texas, county-seat of Hill County, is located in a fine agricultural section. Among its industries are the machine-shops of the M. K. and T., a cotton-mill and compress, a cotton-seed oil mill, tannery, grain-elevator, flour-mill, ice-factory etc. The city has ten churches, an admirable public school system, a twenty thousand dollar high school and a fine courthouse. Hillsboro has pure artesian water and an electric light plant, and owns its waterworks and sewerage system. It has the service of four railroads and a population of 6,115.

Hill'is, Newell Dwight, the pastor of Plymouth Church, Brooklyn, was born in 1858 in Iowa. He is the author of a number of religious and social writings, including *The Investment of Influence; The Influence of Christ in Modern Life; Success Through Self-Help* and *Building a Working Faith.*

Himalaya (*hĭ-mä'lȧyȧ*), from two Sanskrit words, meaning snow-abode, in the southern and central parts of Asia, are not a single range, but a system of parallel ranges some 1,500 miles long. The mountains of the southern range are among the loftiest in the world, many of them exceeding 20,000 feet in height. One, Mt. Everest (29,002), is the highest measured mountain in the world. Among the others are Mt. Godwin-Austen (28,250), Kunchinjinga (28,156), Dhwalagiri (26,826) and Nanda Devi (25,700). They form the southern slope. There are other peaks, whose height has not been ascertained, that are believed to be higher than Mt. Everest. The great rivers of India flow from these mountains through wild, narrow gorges often thousands of feet deep. The mountains are considered sacred among the Hindus, and thousands of pilgrims ascend them yearly, traveling to the holy sources of the Ganges. They divide the central Asian tableland of Tibet from the plain of the Ganges in northern India.

Hincks, Sir Francis, a Canadian statesman, was born at Cork, Ireland, Dec. 14, 1807. He came to Canada and lived in Toronto, became interested in politics and was editor of the *Examiner.* In 1841 he was elected to the Dominion parliament, and later was appointed inspector-general. From 1851 to 1854 he was prime minister of Canada. After serving for some time as governor of the Windward Islands and, later, of British Guiana, he returned to Canada and assisted in the measures that united the British provinces in the Dominion. Knighted in 1869, he served as minister of finance four years. He was editor of the *Journal of Commerce* in Montreal for some years previous to his death, which occurred on Aug. 18, 1885.

Hindu-Kush (*hĭn′dōō kōōsh*), the Indian Caucasus, is a range of mountains forming the westward continuation of the Himalayas, to which they are sometimes considered as belonging. They are separated from them by the Indus River. They separate Afghanistan from Turkestan, stretching westward for 365 miles with an average width of 200 miles. The highest measured peak is over 23,000 feet; Hindu-koh, north of Kabul, is 24,000 feet in height.

Hindustan′. See INDIA.

Hip′pias, an Athenian tyrant, son of Pisistratus. At the death of his father in 527 B. C., he and his brother Hipparchus became joint rulers, and conducted the affairs of the government in accordance with the principles laid down by their father. Hipparchus was assassinated in 514 B. C., however, and then Hippias seized the power of government himself, put to death all whose fidelity to himself he had any reason to suspect, imposed heavy taxes and became generally tyrannical. After two unsuccessful attempts, his despotism was overthrown by the Alcmæonidæ, ancient enemies of his family, aided by a Spartan force led by Cleomenes. Hippias was compelled to leave Attica, and afterwards condemned to perpetual banishment. He went to the court of King Darius of Persia, and succeeding in stirring up that monarch to enter upon the first Persian War against Greece. It is not definitely known whether Hippias was killed at the battle of Marathon or whether he died somewhat later at Lemnos.

Hippocrates (*hĭp-pŏk′rȧ-tēz*), the most celebrated of Greek physicians, was descended from Æsculapius. He was born on the island of Cos about 460 B. C. He was greatly esteemed as a physician, and his teaching gave the medical school at Cos a high reputation. His works were quoted by Plato and by Aristotle, who calls him Hippocrates the Great. He was cautious in his practice, paying attention mainly to diet and nursing, and was charged with letting his patients die because he did nothing seemingly to keep them alive. The works, about 60 in number, called the Hippocratic collection are only in part known to be his writings. Of these are *On Wounds of the Head, Epidemics* and *On Air, Water and Places.* He died at Larissa, in Thessaly, 377 B. C., probably, as other dates are given.

Hip′podrome, the Greek name for a place set apart for horse and chariot races. It was supposed to be about one half mile long and oneeighth wide, and corresponded in most respects to the Roman circus. See OLYMPIC GAMES.

Hippopotamus (*hĭp′pō-pŏt′ā-mŭs*), whose name means river-horse, is a massive, thick-skinned animal of Africa, with short legs and a ponderous body. An air-breathing mammal, it lives in the water as well as on land. The hide is two inches thick, and on leaving the water it is covered with drops of reddish fluid that give rise to the saying that the hippopotamus sweats blood. This exudation gives the skin its dark fleshy-red color. On the head are small pointed ears, small eyes and a very broad snout, the nostrils of which can be tightly closed. The canine teeth are very large and curved, and are sold for ivory. Hippopotami remain mostly in the water during the day, coming to the surface from time to time for air, and go to pasture at night. They often go eight or nine miles to feed. Their ordinary food is grass and water-plants, but they also make inroads on cultivated fields and have been driven from the cultivated regions. They are no longer found in lower Egypt.

Hirsch, Maurice Baron de, an Austrian financier and philanthropist, was born at Munich, in Bavaria on Dec. 9, 1831. Early in life Baron Hirsch had acquired a princely fortune. In 1888 he lost a beloved son, 20 years of age, and this moved him to devote 20 million dollars to the purpose of charity. He consulted prominent Jews in all countries, and by their advice this sum was invested in behalf of destitute Jews in Hungary, Russia, Galicia and Rumania. When, later, the Jews were expelled from the Russian empire, Baron Hirsch devised an emigration scheme, involving the expenditure of about $10,000,000, to aid exiled Jews to settle in other countries, as the Argentine Republic, where 500,000 acres of land were acquired. Here 1,223 families were settled. Baron Hirsch bestowed sums privately in other charities, his benefactions in a single year amounting to $15,000,000. His total gifts are said to amount to 50 millions of dollars. He died in Hungary on April 20, 1896.

His'tory, Teach'ing of. History has long been considered one of the most instructive subjects of human study. The important achievements of men in the great nations of the past are chiefly presented to us in history. The historians who have described the leading events of the chief nations have been among the great scholars and thinkers, as Herodotus, Thucydides, Tacitus, Grote, Von Ranke, Hume, Macaulay, Bancroft. History is valuable in many ways. We cannot understand the present without studying the past. Our important political and social institutions, our customs, our religious ideas, our inventions, our banking system, our schools, our architecture, our shipbuilding, our language and literature have all descended to us out of the past. It is by studying the origin and growth of these things in the past that we can appreciate their place and importance in the present.

History is also very instructive by furnishing examples of human life and character. The leading persons in history stand exposed to our judgment, in their actions and motives and in the results of their work. The statesman must study history in order to learn how to make laws and to govern. The theologian bases all his ideas on a historic past. The problems of political and social progress in the history of leading nations are much like the problems of to-day.

The history of one's own country naturally holds the first place of importance, but we also owe a large debt to all the great peoples of the past. The history in which we are most interested is generally classified as follows: The ancient nations, as Egypt, Judea, Babylon; the Greek and Roman civilizations; the history of medieval Europe; the development of the leading nations of modern Europe, as France, Germany, Spain and England; and, finally, American history.

In our school programmes history holds an important place even in the elementary school. The common-school course of study has been much enriched lately with historical materials. Formerly a year's study was given to history at the end of the grammar-school. Now children are introduced to good history stories from the third and fourth grades on, and keep up the history studies into the eighth grade. American history from the time of the first exploration and settlements to the present time is remarkably well-adapted for use in elementary schools. All the early period of exploration and pioneer settlement is full of adventure and very simple in its setting. It is easy to trace the development of institutions from the rude early settlements on the Atlantic coast down to the present. There has been a gradual development from simple to more complex conditions of government, of industries and of social life. Our course of study is designed to bring to light the leading ideas, the important characters and the chief institutions of our country.

There are four principal periods in our own history: The period of exploration on sea and land; the era of settlement and colonial development till 1760; the struggle with England, the war for independence and the adoption of the constitution; and the growth of the country under the constitution.

In order to make such a course of study more effective with children, the more interesting and striking phases need to be selected. Teachers and textbook writers have of late treated the subjects biographically, so as to lend to history the interest of great personalities, as Columbus, William Penn, Washington, Robert Fulton, Eli Whitney, Andrew Jackson and Lincoln.

Fuller descriptions of the customs and modes of life among the people have added much to the instructiveness of the narrative. Source-materials, as documents, letters and descriptions of eye-witnesses of important events, have been introduced. A large number of excellent reference-books are now found in our libraries. The old habit of giving long chronological tables both of important and unimportant events has given way to a more intelligent and interesting study, based on a few leading topics. There also is a strong disposition to pay less attention to wars and battles and more to the achievments of peace. A more recent tendency is to select only a few of the more striking, pivotal and valuable topics in history and gather about them fuller, richer descriptions. This plan will avoid lumbering the child's mind with a great mass of mere historical data, and will produce a much clearer understanding of the essential facts and ideas developed in history.

The methods of teaching history in the schools have become more vital and efficient. In the earlier grades history-stories are told orally by a skillful teacher, maps are outlined on the blackboard, historical charts showing changes in territory and populations are used, and the discussion of important topics by the children is encouraged. Source-materials and references to the larger histories are used to stimulate independent study and use of books.

Some of the best books for use in the periods mentioned are given thus: 1. For the period of exploration and pioneer life: *The Discovery of the Old Northwest* (Baldwin); *A Book of American Explorers* (Higginson); *A First Book of American History* (Eggleston); *American Indians* (Starr); *The Discovery of America* (Fiske); *Pioneers of France in the New World* (Parkman); *Pioneer History Stories,* in three volumes (McMurry); *American History Told by Contemporaries* (Hart) Vol. I; *The Winning of the West* (Roosevelt); *Life of Christopher Columbus* (Lamartine); *Columbus* (Adams); and *Students' History of U. S.* (Channing).

2. The colonial period: *Pilgrims and Puritans* (Moore); *From Colony to Commonwealth* (Moore); *The Making of Virginia and the Middle Colonies* (Drake); *Life of George Washington* (Scudder); *Autobiography of Benjamin Franklin*; *The Colonies* (Thwaites); *American History Told by Contemporaries* (Hart), Vols. 1 and 2; *The Beginnings of New England* (Fiske); *Old Virginia and Her Neighbors* (Fiske); *The Dutch and Quaker Colonies in America* (Fiske); *Montcalm and Wolfe* (Parkman); *Colonial Era* (Fisher); *English Colonies* (Lodge); and *Old South Leaflets.*

3. Period from 1760 to 1787 (The Revolution): *Life of Samuel Adams* (Hosmer); *The War of Independence* (Fiske); *Washington and His Country* (Fiske-Irving); *Camps and Firesides of the Revolution; Benjamin Franklin* (More); *Paul Jones* (Hapgood); *Boys of '76* (Coffin); *Side-Lights on American History* (Elson); *Formation of the Union* (Hart); *The French War and the Revolution* (Sloane); *The Growth of the American Nation* (Judson); *The American Revolution* (Fiske) in two volumes; and *George Washington* (Lodge), 2 Vols.

4. The United States under the constitution: *History of the United States* (Fiske), grammar-school textbook; *Side-Lights on American History* (Elson), Vol 2; *Alexander Hamilton* (Conant); *Source-Book of American History* (Hart); *American History Told by Contemporaries* (Hart), Vols. III and IV; *Children's Life of Lincoln* (Putnam); *Larger History of the United States* (Higginson); *Boys of '61* (Coffin); *Guide to the Study of American History* (Channing and Hart); *Thomas Jefferson* (Morse); and *The Middle Period* (Burgess).

Books on Methods: Mace: *Method in History*; Hall: *Method of Teaching and Studying History;* and McMurry: *Special Method in History.* C. A. McMurry.

Hoang-Ho (*whăng'hō*) or **Hwang-Ho,** Yellow River, or simply Ho, is 2,600 miles long and one of the principal rivers of China. It rises in Kokoncr, and pursues a very winding course, until it issues into the Gulf of Pe-chi-li. It is said to have changed its course nine times in the last 2,500 years, and often overflows its banks and artificial embankments; the last time in 1887, when it destroyed millions of lives. For this reason it is called China's Sorrow.

Hoar, Ebenezer Rockwood (1816-1895), a Republican politician and eminent jurist of the United States, was attorney-general of the United States in 1869-70 and a member of Congress during 1873-75. He sat upon the commission which in 1871 framed the treaty of Washington. It was he who raised the attorney-general's department to the rank of the modern department of justice.

GEORGE F. HOAR

Hoar, George Frisbie, an American lawyer and statesman, was born at Concord, Mass., Aug. 29, 1826. He was educated at Harvard and admitted to the bar in 1849. In 1869 he was elected a representative in Congress from Massachusetts, and to each subsequent Congress until 1877, when he was elected to the United States senate, to which he was re-elected in 1883, 1889, 1895 and 1901. He was presiding officer of the national Republican convention of 1880. His long career was marked by broad patriotism and conspicuous ability in the discussion and solution of important public question. He died on September 30, 1904.

Ho'bart, Garret Augustus, an American lawyer and public man, was born at Long Branch, N. J., in 1844. He graduated from Rutgers College, and studied law, beginning the practice of his profession at Paterson, N. J., where he permanently resided. In addition to his profession, he engaged in enterprises of a commercial nature, as water-companies, manufactures and railways. He was a Republican in politics, and served in the legislature of New Jersey, both as speaker of the house and as president of the senate. In 1896 he was elected vice-president of the United States on the Republican ticket with Mr. McKinley. He died while vice-president, at Paterson, N. J., Nov. 21, 1899.

Hob'bema, Meindert, a Dutch landscape-painter, was born in 1638, probably at Amsterdam, and became one of the foremost landscape-painters. He died in poverty, at Amsterdam, in December, 1709. One hundred and forty-two of his works have been catalogued, and they command high prices, a small landscape selling for $20,000. The *Avenue Middelharnis, Holland,* in the National Gallery at London, is a fine example of his work.

Hoboken (*hō'bō-ken*), a city of Hudson County, New Jersey, named after a village near Antwerp, Holland. It joins Jersey City on the north and is opposite New York city. Four lines of steamships start

CHART I.

B. C.	Hebrew Nation		Egypt	Greece
	2350. The Flood. 1921. Call of Abraham. 1728. Joseph sold into Egypt. 1706. Jacob removes into Egypt. 1574. Aaron born. 1571. Moses born. 1491. Exodus from Egypt. 1491. The Law given on Sinai. 1451. Moses died. 1451. Joshua leads Israel into Canaan. 1300. Judges rule Israel for 300 years.		**Cheops**, who built the great pyramid. 1350. Sesostus conquers Asia.	
	85. **Deborah** judges Israel. 45. **Gideon** slaughters Midianites.			Fabulous. 63. Jason and the Argonauts. Birth of Hercules.
1200	88. Jephthah. 56 Eli judges Israel. 37. **Samson.** 20. **Samuel.**			94. Trojan War begins. 84. Troy taken.
1100	95. **Saul** anointed King. 55. Slain by the Philistines. 55. **David** reigns. 43. He subdues the Philistines, Ammonites and Syrians. 23. Absalom revolts and is slain. 15. **Solomon** King. 4. Temple dedicated.			68 Codrus, last king of Athens, died. 68 Archons chosen instead of kings. 43. Ionians settle in Asia.
1000	75. Solomon died 75. Rehoboam reigns. 75. Ten Tribes revolt under Jeroboam.		78. **Shishak**, builder of second pyramid. 71. He conquers Judea, takes Jerusalem and plunders the temple.	**Amphyctionic Council**, composed of representatives of principal Greek States, is made the court for settling interstate disputes. Hesiod, poet.
	Judah	**Israel**		
	58. Abijah defeats Jeroboam. 55. Asa, a pious king. 4. Jehoshaphat.	75. Jeroboam I. 54. Nadab. 26. Samaria built. 18. Ahab and Jezebel.		
900	89. Jehoram. 88. Jerusalem plundered by Philistines. 78. Joash. 40. Slays Zachariah, priest. 26. Jerusalem taken by Jehoash.	**Elijah** the prophet. 88. **Elisha** the prophet. 84. Jehu. 40. Jehoash; he defeats Ben-hadad, king of Syria.		**Homer**, the greatest of Greek poets. 80. Lycurgus, "The Spartan Lawgiver."
800				

NOTE. Full explanation of the History Charts and their use will be found on pages 2234 and 2235 immediately preceding History Outlines.

CHART II.

B.C.	Judah	Israel	Assyrian Empire	Greece	Rome
	Uzziah. Joel the prophet. Amos the prophet. 59. Jotham. 42 Ahaz; made tribute to Tiglath-Pileser. 26. **Hezekiah.** **Isaiah** the prophet. Nahum the prophet 10. Sennacherib destroyed.	Jonah the prophet. 84. Anarchy. 47. Invasion of Tiglath-Pileser. 30. Hosea; pays tribute to Shalmanezar. 21. The Ten Tribes carried captive to Assyria. 9. Esarhaddon.	47. Tiglath-Pileser. 28. Shalmanezar.	76. **Epoch of the Olympiads** from which the Greeks reckoned time. 46. Austomenes, last king of Corinth.	53. **Rome** founded by Romulus. 15. Numa Pompilius. 8. Tarentum founded.
700	97. Manasseh. 42. Amon. 41. Josiah. **Jeremiah** the prophet. Zephaniah the prophet. Habakkuk the prophet. 6. Jerusalem taken by Nebuchadnezzar.	**Babylonian Empire** Esarhaddon reigns at Babylon. He plants colonies in Samaria whose descendants are called Samaritans. 6. **Nebuchadnezzar**; he defeats Necho of Egypt, and takes Jerusalem.		85. Second Messenian War. 24. Bloody code of Draco. Sappho, poetess. Ascendency of Sparta.	72. Tullus Hostilius. 40. Ancus Martius; he subdues the Latins. 16. Tarquin the Elder.
600	98. Jehoiachin. 96. Zedekiah. 88. Jerusalem destroyed. **Ezekiel** the prophet	Nineveh destroyed by Nebuchadnezzar.		94. **Solon**, the Athenian Lawgiver. 62. Comedies first exhibited at Athens. 60. **Pisistratus.** **Thales**, founder of Ionic philosophy. 60. Temples built. 34. Thespis exhibits tragedies first at Athens. **Pythagoras**, philosopher. 10. Hippias expelled.	78. Servius Tullius. 34. Tarquin the Proud. 9. The **Republic.** Consuls chosen. 1. Dictatorship created.
	Jews carried captive to Babylon. 61. Evilmerodach. 60. Neriglissar. 55. Belshazzar. 38. Babylon taken by Cyrus the Mede, who establishes the **Medo-Persian Empire** 36. Cyrus' decree restoring the Jews. 21. Darius. Zechariah the prophet. Haggai the prophet. 15. Second temple dedicated.				
500	94. Darius invades Greece. 90. His army defeated at Marathon. 85. **Xerxes** the Great. 81. He invades Greece. 80. He returns defeated. 67. **Ezra** returns to Jerusalem. 64. Artaxerxes I. or Ahasuerus. 56. He makes Esther Queen. 55. **Nehemiah** rebuilds Jerusalem. **Malachi**, last of Old Testament writers.			Anacreon, poet. 91. Death of **Thucydides**, historian. 90. Miltiades defeats the Persians at Marathon. 80. Xerxes defeated at Thermopylæ. 79. Persians defeated at Platæa. **Æschylus**, poet. 64. Third Messenian War. 45. **Herodotus**, historian. 31. Peloponnesian War. 29. Death of Pericles. Euripides, poet. Sophocles, poet. **Socrates**, the great moralist.	98. Tribunes chosen. 82. Coriolanus. 56. **Cincinnatus**, dictator. 51. Laws of the Twelve Tables. Decemvirs appointed. 45. Military Tribunes created.
400					

CHART III.

. C.

Medo-Persian Empire

Artaxerxes Mnemnon.

Cyrus revolts.

Is slain at the battle of Cunaxa.

36. Darius Codomanus.

Greece

95. Corinthian War begins.
80. Olynthian War.
78. Theban War.
71. Battle of Leuctra.
63. Battle of Matineia.
61. Death of Hippocrates.
51. Death of Xenophon, historian.
48. Death of **Plato**, philosopher.
38. War with Macedon.
38. Battle of Chæronea; Philip victorious.

Macedon

59. **Philip the Great.**

Rome

91. Gauls invaded Rome.

90. Rome burned by Gauls.

69. Military Tribunes abolished.

43. Samnian War begins, lasts 71 years.

40. Latin cities surrender.

Macedonian Empire

36. **Alexander** the Great.
34. Invades Persia. Battle of Granicus.
32. Conquers Egypt and Tyre.
30. Battle of Arbela. Persia subdued.
23. Alexander dies at Babylon.

35. Conquers Athens and Thebes.
33. Battle of Issus; Darius defeated.
32. Alexander in Jerusalem.
28. Defeats Pontus of India.

300

At the death of Alexander, the Macedonian Empire was divided into numerous States

Egypt

Ptolemy Lagus, founds Library of Alexander.

84. Ptolemy Philadelphus.
46. Ptolemy Evergetes.
21. Ptolemy Philopater.
4. Ptolemy Epiphanes.

Judea
Subject to Egypt

Syria

Seleucus.

83. Antiochus I.
46. Seleucus II.
26. Seleucus III.
23. Antiochus the Great.

Greece

97. Republic re-established.

81. Achæan League formed.

64. Death of Zeno, philosopher.

71. Death of Epicurus, philosopher.

51. Achæan League renewed.

Macedonia

98. Philip IV.

88. Macedonia subdued by Lysimachus King of Thrace.

Rome

80. Pyrrhus, king of Epirus defeats the Romans.
74. He is driven from Italy.
65. First Punic War.
55. Carthaginians defeated by Regulus.
18. Second Punic War.
18. **Hannibal** crosses the Alps; Romans defeated at Ticinus and Trebia.
16. Battle of Cannæ.
14. First Macedonian War.
3. **Scipio** sent to Africa.
2. He defeats Hannibal.

200

80. Ptolemy Philometer.

45. **Ptolemy Physcon.**

17. Ptolemy Lathyrus.

Antiochus takes Judea and repels the Egyptians.

75. Antiochus IV.

65. **Judas** defeats Antiochus.

35. John Hyrcanus frees Judea from power of Syria.

6. **Aristobulus.**

5. **Alexander Jannæus.**

30. Antiochus VII.

23. Antiochus VIII.

12. Antiochus IX.

91. Sparta becomes a member of the league.

88. Laws of Lycurgus abolished.

78. Perseus.

68. Battle of Pydna.

Second Macedonian War.

72. Third Macedonian War, Perseus defeated.

Macedonia made a Roman province.

49. Third Punic War.

46. Corinth taken; Greece made a Roman province.
46. Carthage destroyed.
34. First Servile War.
2. Second Servile War.

33. Spain conquered.
The Gracchi.

100

Ptolemy Alexander.

70. **Hyrcanus II.**
67. Aristobulus II.

95. Antiochus X.
92. Antiochus XI.
87. Antiochus XII.
69. Antiochus XIII.

90. Social War.
88. First Pontian War.
86. Second Pontian War.
73. Third Servile War, under Spartacus.

54. Death of **Lucretius**, poet.
35. Death of Sallust, historian.
19. Death of **Virgil**, poet.
8. Death of **Horace**, poet.

65. Berenice, Queen.

45. Cleopatra.

66. Pompey subdues Syria and Judea.
60. First Triumvirate—Pompey, Crassus and Cæsar.
55. Cæsar invades Britain.
48. Civil War between Cæsar and Pompey.
47. Battle of Pharsalia; Pompey defeated.
45. **Cæsar** Dictator.
43. Second Triumvirate—Octavius, Antony and Lepidus.

63. **Cicero** crushes Cataline.

53. Crassus slain by Parthians.

44. Cæsar assassinated.

31. Antony overthrown.

30. Egypt subdued.

30. Octavius, surnamed Augustus, Emperor.

. D.

CHART IV.

A. D.		
	THE ADVENT. 14. Augustus died. Tiberius, Emperor. 36. Caligula. 41. Claudius. 54. **Nero.** 70. Vespasian. 70. Jerusalem destroyed. 79. Titus. 81. Domitian. 98. Trajan.	71. **Livy**, historian, died. 25. **Strabo**, historian, died. 65. **Seneca**, philosopher, put to death by Nero. 79. Pliny the Elder died. 79. Herculaneum and Pompeii destroyed by eruption of Vesuvius. 81. Agricola conquers Britain. 97. **Quintilian**, orator and writer, died. 97. **Josephus**, Jewish historian, died.
100	17. Hadrian, surnamed The Best. 37. He rebuilds Jerusalem. 38. **Antoninus Pius.** 61. **Marcus Aurelius.** 80. Commodus. 93. Septimius Severus.	15. Pliny the Younger died. 20. **Plutarch**, biographer, died. 28. Juvenal, poet, died. 35. **Tacitus**, historian, died.
200	11. Caracalla and Geta, sons of Severus. 18. Heliogabalus. 22. Alexander Severus. 68. Claudius II. 70. Aurelian; he defeats the Goths and Germans. 84. Diocletian.	**Tertullian**, an able defender of Christianity, originally a pagan. 54. **Origen** suffers martyrdom.
300	12. **Constantine** the Great. 30. Seat of Empire removed to Constantinople. 61. Julian the Apostate. 64. Empire divided. Valentinian Emperor of the West. Valens of the East. 79. Theodosius the Great, reunites the Empire. 95. Empire permanently divided. Arcadius Emperor of the West. Honorius of the East.	16. Arius. 25. Council of Nice. 35. Athanasius, bishop of Alexander, exiled.
400	Alaric the Goth invades Italy. 9. Invasion of Spain by the Vandals, Alians, and Suevi. 10. Alaric sacked Rome. 51. Attila the Hun defeated. 55. Rome plundered by the Vandals under Genseric. 75. Romulus Augustulus, last Emperor of Rome. 76. Roman Empire overthrown by Odoacer, King of the Heruli.	7. **St. Chrysostom** died. 30. **St. Augustine** died.
500		

It is not deemed necessary to represent the next five centuries by Charts, as little or no progress was made in intellectual or national life during that period.

CHART V.

A.D.	England	France	Germany	Various Countries
1000	2. Massacre of St. Brice. 13. **Danish Kings.** 17. Canute I., the Great. 39. Canute II. 41. **Saxons Restored.** Edward the Confessor. 44. Common Law Established. 66. **Norman Kings.** William the Conqueror.	Robert II. Son of Hugh Capet. 31. Henry I. 60. Philip I. Invasion of William the Conqueror. 96. First Crusade.	2. St. Henry. 24. Conrad II. 39. Henry III. 56. Henry IV. 73. War with Saracens begins.	35. Kingdom of Aragon. 54. Schism or separation of the Greek Church from Rome. 65. Turks take Jerusalem. 73. War of Investitures. 73. Hildebrand becomes Pope Gregory VII.
1100	Henry I. Usurper. 54. Henry II. **House of Plantagenet.** 71. Ireland subdued. 89. Richard I. Cœur de Leon.	8. Louis VI. the Fat. 37. Louis VII. 46. Second Crusade. 80. Philip II. 87. Third Crusade. 91. Fourth Crusade. Abelard, Scholastic Philosopher.	6. Henry V. 38. Conrad III. 52. Frederic I. (Barbarossa) invades Italy. 63. Berlin founded. 95. Two Sicilies acquired.	Crusaders take Jerusalem. 25. Venetian Wars. 59. Alexander III. Italy. 71. Saladin, Sultan of Egypt. 94. Innocent III., Pope.
1200	15. The Magna Charta Signed. 16. Henry III. 62. The Barons' War. 65. Barons defeated by Edward at Eversham. 72. Edward I. 82. Wales conquered. 84. Title Prince of Wales created.	8. Albigensian Crusade. 23. Louis VIII. 26. Louis IX. 28. Sixth Crusade. 45. Seventh Crusade. 70. Eighth Crusade. 85. Philip IV.	8. Otto IV. 12. Frederic II. 41. League of Hansetowns. 73. **House of Hapsburg.** Rodolph I.	4. The Inquisition instituted. 15. Doctrine of Transubstantiation and Auricular Confession established. 18. Genghis Khan, Mogul, subdues Persia. 29. Laity prohibited from reading the Scriptures. 38. Kingdom of Granada. 65. Dante born. 82. Sicilian Vespers.
1300	7. Edward II. 14. Battle of Bannockburn. 27. Edward III. 28. Chaucer born. 46. Battle of Crecy. 56. Battle of Poictiers. 77. Richard II. 84. John Wickliffe died. 99. Henry IV. **House of Lancaster.**	16. Philip V. 28. Philip VI. **House of Valois.** 45. Dauphiny annexed. 64. Charles V. 80. Charles VI. Froissart, historian.	7. William Tell. Switzerland revolts. 9. Henry VII. 30. *Gunpowder Invented.* 38. German Princes deny the temporal power of Pope. 49. Charles IV. 56. He issues the "Golden Bull."	8. Popes removed to Avignon. 11. Knights Templars abolished. 21. Dante died. 74. Petrarch died. 87. Margaret, Queen of Denmark and Norway. 95. Tamerlane in Russia.
1400	13. Henry V. Wars with France. 15. Battle of Agincourt. 22. Henry VI. 53. War of Roses. 61. Edward IV. **House of York.** 83. Richard III. 85. Henry VII. **House of Tudor.**	22. Charles VII. 29. Joan of Arc at Orleans. 30. She is burned by the English. 51. The English driven from France. 61. Louis XI. 85. Charles VIII.	15. Council of Constance. John Huss burned. 31. **House of Austria.** 35-58. *Printing Invented.* 83. Martin Luther born.	Tamerlane overran Syria. House of Medici in Florence. 53. Constantinople taken by Turks. Isabella and Ferdinand unite Castile and Aragon. 92. Columbus discovers America.
1500	9. Henry VIII. 13. Battle of Flodden. 33. Henry divorces Catherine and marries Anne Boleyn. 36. Beheads Anne and marries Jane Seymour. 47. Edward VI. Cranmer. 53. Bloody Mary. 58. Elizabeth reigns. 64. Church of England Established. Puritan party formed. 87. Mary Queen of Scots beheaded.	Louis XII. 15. Francis I. 47. Henry II. 59. Francis II. 62. Huguenots' War. 64. John Calvin died. 72. Massacre of St. Bartholomew. 74. Henry III. 89. Henry IV. **House of Bourbon.**	16. Luther begins the Reformation. 19. Charles V. 21. Diet of Worms. 30. Augsburg Confession. 56. Charles abdicates. Ferdinand I. chosen Emperor.	4. French in America. 13. Leo X., Pope. 13. Ponce de Leon in Florida. 21. Wars of Charles V. in Italy. 32. Pizzarro conquers Peru. 33. Ivan IV. of Russia. 35. Order of Jesuits founded. 36. Cortez conquers Mexico. 56. Philip II. of Spain. 59. Frederick II. of Denmark.

CHART VI.

A. D.	England	France	Prussia and Germany	Various Countries
1600	3. James I. **House of Stuart.** 11. Translation of Bible. 16. **Shakespeare** died. 25. Charles I. 26. Sir Francis Bacon died. 49. Oliver Cromwell. **The Commonwealth.** 60. Stuarts restored. Charles II. 79. Habeas Corpus Act. 85. James II. 88. William Prince of Orange Milton. Locke.	10. Henry IV. murdered. 10. Louis XIII. 20. Navarre annexed. 29. Cardinal Richelieu. 43. Louis XIV. 48. Wars of the Fronde. 50. Des Cartes died. 85. Edict of Nantes revoked. 97. Peace of Ryswick.	18. Thirty Years' War begins. 20. Battle of Prague. 30. **Kepler** died. 32. Battle of Lutzen. 40. Frederick William the Great. 48. Peace of Westphalia. 78. Peace of Nimuegen.	9. Arminius, divine, died. 11. Gustavus Adolphus of Sweden. 42. **Galileo** died.—Italy. 44. Christina crowned. 62. Catherine I. of Russia. 89. **Peter the Great** of Russia. 97. Charles XII. of Sweden.
1700	2. War with France. 13. Peace of Utrecht. 14. George I. **House of Hanover.** 27. George II. 27. Sir Isaac Newton died. 29. Rise of Methodists. Wesley and Whitfield. 39. War with Spain. 46. Charles, son of Pretender, defeated at Culloden. 56. War with France. 56. Chatham, Prime Minister. 60. George III. 75. War with United States. 93. War with France. 94. Gibbon, historian, died. 96. Robert Burns died. 97. Edmund Burke died.	15. Louis XV. 38. Peace of Vienna. 48. Peace of Aix-la-Chapelle. 56. War with England. 63. Peace of Paris. 74. Louis XVI. 78. Voltaire died. 83. Peace of Versailles. 89. States General. **The Revolution.** 93. Republic declared. **Reign of Terror.** 95. The Directory. 97. The Consulate.	4. Battle of Blenheim. 13. Peace of Utrecht. 14. Peace of Rastadt. 22. Pragmatic Sanction. 40-48. War of the Austrian Succession. 40. **Frederic II.**, the Great. 41. Charles VII. 45. Francis I. 56. Seven Years' War begins. 65. Joseph II. 92. Francis II. 97. Frederic William III.	12. St. Petersburg founded. 25. Catherine II.—Russia. 27. Elizabeth.—Russia. 33. War between France and Poland. 69. Clement XIV. 96. Napoleon invaded Italy. 97. Peace of Campo Formio. 98. Pius IV. deposed by Napoleon.
1800	Ireland united to Great Britain. 5. Battle of Trafalgar. 7. Slave Trade abolished. 8. Peninsular War. 12. **War with United States.** 14. Peace with France. 15. War with Napoleon renewed. 20. George IV. 29. William IV. 32. Sir Walter Scott died. 37. **Victoria crowned.** 54. Crimean War. 56. War with Persia and China. 57. Mutiny in India. 66. Atlantic Cable laid. 67. Fenian troubles. 67. War with Abyssinia. 72. Conference of Geneva. 78. Afghanistan War. 82. War in Egypt. 97. Queen's Diamond Jubilee. 98. Gladstone died. 99. Boer War.	4. **Bonaparte** Emperor. 12. Invades Russia. 13. Battle of Leipsic. 14. Louis XVIII. 15. **Waterloo.** Napoleon overthrown. 30. Louis Philippe. 35. Death of Lafayette. 47. Revolution. Louis Philippe abdicates. 48. Republic. 52. **Napoleon III.**, Emperor. 70. War with Prussia. Napoleon surrendered at Sedan. 71. **The Republic.** Thiers, President. 73. Napoleon III. died. 94. President Carnot assassinated.	6. Battle of Jena 4. Francis II. of Austria assumed title of Emperor. 5. Battle of Austerlitz. 12. War with Russia. 13. War with France. 16. Germanic Confederation. 40. Frederic William IV. 48. Hungarian War. **Francis Joseph.** 59. War with Italy and France. 61. **William I.** 66. North German Confederation. 66. War with Prussia. 70. War with France. 71. King William proclaimed Emperor of Germany. 72. Jesuits expelled from empire. 88. William I. died March 9. 88. Frederick III. died July 15. 88. William II. becomes Emperor. 98. Bismarck died.	1. Alexander.—Russia. 15 Netherlands united. 26. Nicholas.—Russia. 30. Belgium independent. 49. Victor Emanuel II. — Italy. 55. Alexander II.—Russia. 61. Russian serfs emancipated. 77. War between Russia and Turkey. 81. Alexander II. assassinated. 81. Alexander III.—Russia. 91. Famine in Russia. Jews expelled. 94. China-Japan War. 96. Nicholas II.—Russia. 98. Spanish-American War.
1900	01. Victoria died. 01. Edward VII. 02. Boer War concluded. 10. George V.	00. Paris Exposition. 06. Fallieres, President. 13. Poincare, President.	00-10. Great commercial development and industrial expansion.	00. Partition of Samoa. 00. Boxer rising in China. 00. King Humbert, Italy, assassinated. 01. Australian federation. 04. Russo-Japanese War. 08. Messina destroyed by earthquake.

CHART VII.

1001. Icelandic navigators visit the coast of New England.
1492. Columbus discovered America.
1497. Cabot discovered Newfoundland.
1499. Amerigo Vespucci visited America.
1512. Ponce de Leon discovered Florida.

1513. Balboa discovered the Pacific.
1517. Cordova discovered Yucatan.
1521. Conquest of Mexico by Cortèz.
1528. Narvaez's expedition to Florida.
1534. Cartier explores the St. Lawrence.

A. D.
1600

7. First settlement in **Virginia**, at Jamestown.
9. Second Charter granted.

New York

9. Henry Hudson discovers the Hudson River.
10. The starving time.
12. Third Charter granted.
14. Dutch settle on Manhattan Island.
15. Tobacco first cultivated.
19. *Slavery introduced.*

Massachusetts

20. The Pilgrims settle at Plymouth.
21. Cotton first cultivated.
22. Indian massacre at Jamestown.
23. New Hampshire settled at Dover.
30. Boston settled.
32. **Maryland** granted to Lord Baltimore.
34. Settled by Catholics at St. Marys.
35. Co
36. **Rhode Island**
44. Second Indian massacre.
37. Peq
38. Nev
38. Harvard College founded.
60. Navigation Act passed.
39. Newport founded.
62. Cha
43. New England Colonial Union.
64. **North Carolina** settled.
64. Captured by the English.
64. **New Jersey** settled at Elizabethtown.
75. King Philip's War.
76. Bacon's Rebellion.
89. King William's War.
82. **Delaware** separated from New York.
92. Witchcraft excitement.

1700

2. Queen Anne's War.
32. Washington born.
44. Negro plot.
41. **New Hampshire** separated from Massachuse
54. French and Indian War.
70. Boston Massacre.
65. Colonial Congress.
Declaration of Rights.
73. Tea destroyed in Boston Harbor.
65. The Stamp Act.
The Virginia Resolutions.

REVOLUTIONARY WAR

75. Battle of Lexington.
Battle of Bunker Hill.
76. Battle of Long Island.
76. Norfolk burned.
Battle of White Plains.
Forts Washington and Lee captured by the British.
76. Battle of Trenton.
77. Battle of Bennington.
77. Battle of Princeton.
Saratoga—Surrender of Burgoyne.
79. Capture of Stony Point.
78. Battle of Monmouth.
80. Battle of King's Mountain.
81. Battle of Guilford Court House.
81. Surrender of Cornwallis.
82. Cessation of hostilities.
83. Treaty of Peace.
87. Constitution adopted.
89. Washington elected President.

CHART VIII.

1789	**GEORGE WASHINGTON**, Pres't. **John Adams**, Vice-President. 90. Indian troubles in Ohio. 90. General Harmar defeated. 90. Capital removed to Philadelphia.	91. Vermont admitted. 91. St. Clair defeated. 91. United States Bank established. 92. Kentucky admitted. 93. Whitney invents cotton gin.	**George III.**
	WASHINGTON re-elected President. **John Adams**, Vice-President 93. Difficulty with Genet, French Ambassador. 94. Whisky insurrection.	94. Wayne's victory at Maumee. 95. Jay's Treaty. 96. Tennessee admitted.	**French Revolution.** 93. **Reign of Terror.**
1797	**JOHN ADAMS**, President. **Thomas Jefferson**, Vice-President. 98. War with France	99. Washington died, aged 67. 99. Treaty with France. 1800. Capital removed to Washington.	99. Overthrow of the Directory. 99. **Napoleon Bonaparte** first Consul.
1801	**THOMAS JEFFERSON**, President. **Aaron Burr**, Vice-President. 1. War with Tripoli. 3. Ohio admitted into the Union.	3. Purchase of Louisiana. 3. Preble sent against Tripoli. 4. Hamilton killed by Burr.	4. Napoleon Emperor. 4. Irish Rebellion.
	JEFFERSON re-elected President. **George Clinton**, Vice-President. 6. Burr's Conspiracy. 7. English and French restrictions on commerce.	7. The Embargo Act passed. 7. Attack on the *Chesapeake*. 7. Fulton's first steamboat on the Hudson.	5. Battle of Austerlitz. 6. Battle of Jena. 8. Peninsular War.
1809	**JAMES MADISON**, President. **George Clinton**, Vice-President. 11. Battle of Tippecanoe. 11. Fight between the *President* and the *Little Belt*. 12. War declared against England. 12. Louisiana admitted.	12. Surrender of Mackinaw. 12. Surrender of Queenstown. **Naval Battles.** 12. The *Constitution* and the *Guerriere*. 12. The *Wasp* and the *Frolic*. 12. The *United States* and the *Macedonian*. 12. The *Constitution* and the *Java*.	9. Battle of Wagram.
	MADISON re-elected President. **Elbridge Gerry**, Vice-President. 13. Battle of Frenchtown. 13. Siege of Fort Meigs. 13. Perry's Victory. 13. Battle of the Thames. **Naval Battles.** 13. The *Hornet* and the *Peacock* 13. The *Chesapeake* and the *Shannon*. 13. The *Argus* and the *Pelican*. 13. The *Enterprise* and the *Boxer*.	14. The Creek War ended at Horse Shoe Bend. 14. Battle of Lundy's Lane. 14. Washington captured and burned. 14. Battle of Plattsburg. 14 Hartford Convention. 14. Treaty of Ghent. 15. Battle of New Orleans. 16. Indiana admitted.	15. Battle of Waterloo. Napoleon banished. 15. Treaty of Paris. **George IV.**
1817	**JAMES MONROE**, President. **Daniel Tompkins**, Vice-President. 17. Mississippi admitted. 18. The Seminole War. 18. Capture of Pensacola.	18. Illinois admitted. 19. Alabama admitted. 19. Florida purchased of Spain. 20. Maine admitted. 20. The Missouri Compromise.	
	MONROE re-elected President. **Daniel Tompkins**, Vice-President.	21. Missouri admitted. 24. Visit of Lafayette.	21. Death of Napoleon. Charles X.

CHART IX.

1825	**JOHN QUINCY ADAMS**, President. **John C. Calhoun**, Vice-President. 25. Controversy concerning removal of Creek Indians.	26. John Adams died. 26. Thomas Jefferson died.	Frederick William III.
1829	**ANDREW JACKSON**, President. **John C. Calhoun**, Vice-President. 32. Black Hawk War. 32. Excitement concerning tariff legislation.	32. Nullification in South Carolina. 32. The President vetoes the bill to recharter the United States Bank.	30. Louis Philippe. 30. Revolution in Poland. 32. Parliamentary Reform.
	JACKSON, re-elected President. **Martin Van Buren**, Vice-President. 33. Removal of public funds from the Bank of the United States.	35. Seminole War. 36. Arkansas admitted.	
1837	**MARTIN VAN BUREN**, President. **Richard M. Johnson**, Vice-Pres't. 37. Great financial revulsion.	Continuation of Seminole War. 37. Battle of Okachotee. 37. Michigan admitted.	37. **Victoria.** 40. Frederick Wilhelm IV.
1841	**WILLIAM H. HARRISON**, Pres't. **John Tyler**, Vice-President. President Harrison died April 4th, 1841. **TYLER**, President.	41. The Northwestern boundary fixed by treaty. 41. Sub-Treasury bill repealed. 41. President vetoes the United States Bank. 43. The "Dorr Rebellion" in Rhode Island.	
1845	**JAMES K. POLK**, President. **George M. Dallas**, Vice-President. 45. Florida admitted. 45. Texas annexed. 46. Iowa admitted. 46. General Taylor sent to the Rio Grande. 46. *War with Mexico* declared. 46. Battle of Palo Alto. 46. Battle of Resaca de la Palma. 46. Matamoras captured. 46. Monterey captured.	47. Battle of Buena Vista. 47. Capture of Vera Cruz. 47. Battle of Cerro Gordo. 47. Battle of Contreras. 47. Capture of Molino del Rey. 47. Capture of Chapultepec. 47 Fall of Mexico. 48. Treaty of Peace. 48. Gold discovered in California. 48. Wisconsin admitted.	48. Revolution in Hungary. 48. Republic proclaimed in France. Louis Napoleon Bonaparte elected President.
1849	**ZACHARY TAYLOR**, President. **Millard Fillmore**, Vice-President. 49. Territory of *New Mexico* organized. 50. Taylor died July 9th. **FILLMORE**, President. 50. *California* admitted into the Union.	50. Territory of *Utah* organized. 50. *Population of U. S. 23,191,876.* 51. Fugitive Slave Law enacted. 52. Henry Clay died, aged 75. 55. Daniel Webster died, aged 70.	
1853	**FRANKLIN PIERCE**, President. **W. R. King**, Vice-President. 53. The *Gadsden Purchase.*	52. Kansas-Nebraska Bill passed. 54. Kansas struggle begun. 54. Perry's treaty with Japan.	52. **Louis Napoleon,** Emperor. 54. Crimean War.
1857	**JAMES BUCHANAN**, President. **John C. Breckenridge**, Vice-Pres't. 57 Mormon insurrection. 57. Continued violence in Kansas. 57. General monetary panic.	58. *Minnesota* admitted into the Union. 59. *Oregon* admitted into the Union. 59. John Brown's raid. 60. South Carolina secedes from the Union. 60. *Population of U. S. 31,443,231*	

CHART X.

1861	**ABRAHAM LINCOLN**, President. **Hannibal Hamlin**, Vice-President. 61. Mississippi, Alabama, Florida, Georgia, Louisiana and Texas secede. 61. Kansas admitted. 61. Southern Confederacy formed. 61. Attack on Sumter. 61. Virginia, Tennessee, North Carolina and Arkansas secede and join the Confederacy. 61. Seizure of Harper's Ferry and Norfolk. 61. Battle of Philippi. 61. Union repulse at Big Bethel. 61. Battle of Bull Run. 61. Battle of Wilson's Creek. 61. Battle of Ball's Bluff. 61. Battle of Belmont. 62. Battle of Mill Spring. 62. Capture of Fort Donelson. 62. The Monitor and the Merrimac. 62. Battle of Pea Ridge 62. Battle of Shiloh. 62. Capture of New Orleans. 62. McClellan's seven days' battles. 62. Battle of Richmond, Ky. 62. Second battle of Bull Run. 62. Battle of Corinth. 62. Battle of Antietam.	62. Battle of Fredericksburg. 62. Battle of Stone River. 63. The *Emancipation Proclamation.* 63. Battle of Chancellorsville. 63. Battle of Gettysburg. 63. Surrender of Vicksburg. 63. Draft riots in New York. 63. Battle of Chickamauga. 63. Battles of Lookout Mountain and Missionary Ridge. 63. *West Virginia* admitted. 64. Wilderness Battles. 64. Battle of Spottsylvania. 64. Battle of Cold Harbor. 64. Petersburg besieged. 64. Battle of Resaca. 64. Battle of Kenesaw. 64. Battle of Atlanta. 64. Battle of Mobile Bay. 64. Battle of Winchester. 64. Battle of Fisher's Hill. 64. Battle of Cedar Creek. 64. *Nevada* admitted. 64. Sherman's march to the sea. 64. Sinking of the Alabama. 65. Capture of Fort Fisher.	61. Prince Albert died.
1865	**LINCOLN** re-elected President. **Andrew Johnson**, Vice-President. 65. Battle of Bentonsville. 65. Battle of Five Forks. 65. Capture of Petersburg. 65. Fall of Richmond. 65. *Surrender of Lee.* 65. Surrender of Johnston. 65. *Lincoln Assassinated,* April 14.	**ANDREW JOHNSON**, President. 66. The Atlantic Cable laid. 66. Tennessee readmitted. 67. *Nebraska* admitted. 67. Purchase of Alaska. 67. Fourteenth Amendment adopted. 67. Amnesty proclamation. 68. Impeachment of President Johnson.	65. Fenian insurrection in Ireland. 66. Austro-Prussian War. 66. North German Confederation formed.
1869	**ULYSSES S. GRANT**, President. **Schuyler Colfax**, Vice-President. 69. Pacific Railroad completed. 70. Fifteenth Amendment adopted. 70. *Population of U. S. 38,558,371.* 71. Chicago burned.	72. Settlement of the *Alabama Claims.* 72. Settlement of the *Northwestern Boundary.* 72. William H. Seward died, aged 71. 72. Horace Greeley died, aged 61.	70-71. Franco-Prussian War. 71. Battle of Sedan. Napoleon III. overthrown. 72. King William proclaimed Emperor. Rise of French Republic. **Thiers**, President.
1873	**GRANT** re-elected President. **Henry Wilson**, Vice-President. 73. The Modoc War. 73. The great financial panic.	76. The Custer Massacre. 76. *Colorado* admitted. 76. The *Centennial Exhibition.*	
1877	**RUTHERFORD B. HAYES**, Pres't. **William A. Wheeler**, Vice-Pres't. 77. The Nez Perce War.	77. The Remonetization of Silver. 79. Resumption of Specie Payments. 80. *Population of U. S. 50,182,525.*	77. Russo-Turkish War. Fall of Turkish power in Europe.
1881	**JAMES A. GARFIELD**, President. **Chester A. Arthur**, Vice-President. 81. President Garfield shot, July 2, by Charles J. Guiteau.	81. His death, September 19. **CHESTER A. ARTHUR**, President. 82. Trial and sentence of Guiteau.	81. Alexander II. of Russia assassinated.

CHART XI.

1885	**GROVER CLEVELAND**, President. **Thomas A. Hendricks**, Vice-Pres't. 85. Gen. U. S. Grant died, July 23. 85. Gen. Geo B. McClellan died, Oct. 29. 85. Public Debt, $1,863,964,873.14.	85. Gen. Winfield S. Hancock died, Feb. 12. 85. Vice-President Hendricks died, Nov. 23. 85. Government Expenditures, $260,226,935. 86. Haymarket riot, Chicago. 86. Gen. John A. Logan died, Dec. 26. 88. General Sheridan died, August 5.	88. William I., Germany died March 9. Frederick III. of Germany died June 15. William II., Emperor.
1889	**BENJAMIN HARRISON**, President. **Levi P. Morton**, Vice-President. 89. Washington admitted. 89. Montana admitted. 89. Public Debt, $1,619,052,922.23. 89. Government Expenditures, $229,288,978. North and South Dakota admitted.	90. Idaho admitted. 90. Population of United States, 62,622,250. Pan-American Congress. Behring Sea arbitration. Wyoming admitted. 91. General Sherman died, February 14.	
1893	**GROVER CLEVELAND**, President. **Adlai E. Stevenson**, Vice-President. 93. Wilson tariff measure. 93. Commercial and monetary panic. 93. Public Debt, $1,545,985,686.13.	93. Government Expenditures, $383,447,954. 93. World's Columbian Exposition at Chicago. 94. Railroad riots at Chicago. 96. Venezuelan imbroglio.	94. President Carnot of France assassinated.
1897	**WILLIAM McKINLEY**, President. **Garrett A. Hobart**, Vice-President. 97. Government Expenditures, $365,774,159. 97. Public Debt, $1,817,672,665.90. 98. Hawaii annexed. 98. Battleship *Maine* destroyed at Havana, February 15. War with Spain declared, April 25. Naval Victory, Manila Bay, May 1. Battle of Guasimas, June 24. Battle of San Juan and El Caney, July 1	98. Naval Victory at Santiago, July 3. Surrender of Spanish Army, Santiago. Manila surrendered. Treaty of Peace signed at Paris, Dec. 10. Porto Rico, the Philippines and Guam ceded to the U. S. Filipino revolt. 1900. Galveston destroyed by hurricane. Population of U. S., 76,303,387.	97. War between Turkey and Greece. Famine in India. King Humbert of Italy assassinated July 29, 1900. 1900. Boxer rising in China. Partition of Samoa. Boer War.
1901	**WILLIAM McKINLEY**, President. **Theodore Roosevelt**, Vice-President. President McKinley shot Sept. 6, died Sept. 14. 01. Public Debt, $2,143,326,933.89.	**THEODORE ROOSEVELT**, President. Civil Government in the Philippines inaugurated July 4. 02. Cuban Government organized. 03. Dept. Commerce and Labor established. 03. Alaskan Boundary settled. 04. Panama Canal treaty. 05. Mediation ends Russo-Japanese War. 05. Suits against trusts begun.	Queen Victoria died January 22, 1901. Edward VII., King. 01-02. Boer War continued. 03. Panama established. 04. Russo-Japanese War. 05. Russo-Japanese War ends. 05. Union of Sweden and Norway dissolved. Prince Charles of Denmark becomes King of Norway as Haakon VII.
1905	**THEODORE ROOSEVELT**, President. **Chas. Warren Fairbanks**, Vice-Pres't. 05. Public Debt, $2,274,615,063.84. 05. Government Expenditures, $567,411,611. 06. San Francisco destroyed by earthquake and fire.	06. Cuban revolt and intervention by U. S. 06. Pure food law passed. 06. Railroad rate law passed. 07. Oklahoma admitted. 07. Financial panic. 08. Grover Cleveland died.	06. First Russian Douma. 06. Frederick VII. King of Denmark. 08. Bulgarian independence declared. 08. Messina and Reggio destroyed by earthquake; 76,483 lives lost. 09. Turkish Revolution. Abdul Hamed II. deposed. Mehmed V. Sultan. 10. Disastrous flood in Paris.
1909	**WILLIAM HOWARD TAFT**, Pres't. **James S. Sherman**, Vice-President. 09. Public Debt, $2,639,546,241.04. Government Expenditures, $779,117,186. 09. North Pole reached by Robert E. Peary. 10. Population of United States, 91,972,266.	10. Postal Savings Banks Established. 12. New Mexico and Arizona admitted. 12. Parcel Post Established. 12. Progressive Party Formed. 12. Titanic Disaster. 13. Dept. of Labor Established.	10. Edward VII. of England died. George V. King. 10. Portuguese Republic established. 10. South African Union formed. 11. South Pole reached by Amundsen. 11. Turco-Italian War begins. 11. Revolution in Mexico. Diaz succeeded by Madero. 12. Turco-Italian War ends. 12. Chinese Republic proclaimed. 12. Christian IX. of Denmark dies. Christian X. King.
1913	**WOODROW WILSON**, President. **Thomas R. Marshall**, Vice-President. 12. Public Debt $2,868,373,874.16. 12. GovernmentExpenditures$720,599,295.65 13. Chinese Republic recognized. 13. Sixteenth Amendment (Income Tax) 13. Seventeenth Amendment (Popular election of Senators.)	13. Tariff revised. 13. Federal Income Tax law passed. 13. Currency Bill passed. 14. Clayton Anti-Trust Law. 14. Federal Trade Commission established.	12. Balkan War begun. 12. Revolution in Mexico, Madero deposed. 12. Mutsuhito, Emperor of Japan died. Yoshihito Emperor. 13. George I. of Greece assassinated. Constantine I. King. 13. Balkan War ends. 13. Madero killed. Huerta provisional president. 14. Huerta resigns. 14. Francis Ferdinand of Austria assassinated. 14. Great War begins.

CH

1500 **French Period** 1600

1497. Cabot discovered Newfoundland.
1498. Sebastian Cabot discovered Hudson Strait.
1500. Cortereal entered Gulf of St. Lawrence.
1518. Baron de Levy visited Sable Island.
1524. Verazzano explored coast of Nova Scotia.

1500

34. Jacques Cartier — first landing on Canadian soil.
35. Cartier's second voyage — visits Stadcona (Quebec) and Hochelaga (Montreal).
76-78. Frobisher explores Arctic Canada.
85. John Davis discovered Davis Strait.
98. Marquis de la Roche lands convicts on Sable Island.

1600

04. DeMonts and Champlain on coast of Nova Scotia.
05. Port Royal founded by Poutrincourt.
08. Quebec founded by Champlain.
09. Champlain defeated Iroquois and discovered Lake Champlain.
10. Henry Hudson explores Hudson Bay.
11. Jesuits arrive in Acadia.
13. St. Johns, Newfoundland, founded. Port Royal destroyed by Argall.
16. Wm. Baffin explores Baffin's Bay.
17. Iroquois invade Canada.
23. English in Nova Scotia.
29. Capture of Quebec by English.
32. Treaty of St. Germain. Quebec restored to France.
35. Lake Michigan discovered by Nicollet.
40. Lake Erie discovered by Jesuits.
42. Montreal founded.
54. Acadia taken by English.
55. Treaty of Westminster. Canada and Acadia restored to France.
68. Pere Marquette founded Mission at Sault Ste. Marie.
70. Hudson Bay Company founded.
89. Lachine massacre.
90. Phipps captures Port Royal—is repulsed at Quebec.
91. Schuyler's raid into Canada.
96. Nova Scotia made royal province.
98. Population of Canada 13,355.

1700

09-11. Canada invaded by Englis Port Royal taken by Nicho son.
13. Treaty at Utrecht. Louisbur founded.
19. First government founded English in Nova Scotia.
45. Louisburg captured.
48. Louisburg restored to Franc by Treaty of Aix-la-Chapell
49. Halifax founded.
55. Expulsion of Acadians.
58. Representative government e tablished in Nova Scotia.

Seven Years' War.

58. Capture of Louisburg English.
58. Battle of Ticonderoga.
59. Siege of Quebec; defeat French on Plains of Abra ham by General Wolfe: su render of Quebec.
60. Capitulation of Montreal.
63. Treaty of Paris. Canada an all its dependencies su rendered to English.

England

09. Henry VIII.
53. Bloody Mary.
58. Elizabeth.
87. Mary Queen of Scots beheaded.

France

15. Francis I.
47. Henry II.
59. Francis II.
62. Huguenot War.
74. Henry III.
89. Henry IV.

England

03. James I.
11. Translation of Bible.
49. Oliver Cromwell. The Commonwealth.
60. Charles II.
85. James II.
88. William, Prince of Orange. Milton. Locke.

France

10. Louis XIII.
29. Cardinal Richelieu.
43. Louis XIV.
48. Wars of the Fronde.
87. Peace of Ryswick.

Germany

18. Thirty Years' War begins.
40. Frederick William the Great.
48. Peace of Westphalia.

England

02. War with France.
13. Peace of Utrecht.
14. George I.
29. George II.
89. War with Spain.
46. Charles, son of Pretende defeated at Culloden.
56. War with France.
60. George III.
75. American Revolution.
93. War with France.

T XII.

English Period

Pop. 1763 about 60,000.
Conspiracy of Pontiac.
Montreal partly destroyed by fire.
Prince Edward Island made a separate province.
Quebec Act.
American Revolution. Invasion of Canada by Americans. Montgomery defeated at Quebec.
Treaty of Versailles. Canadian southern boundary established.
New Brunswick and Cape Breton made separate provinces.
Constitutional Act. Province divided into **Upper and Lower Canada.** Pop. 161,811.
Toronto founded.

1800

09. First steamboat on St. Lawrence.
12. **War of 1812.**
12. Surrender of Detroit.
12. Americans repulsed at Queenston and at Odelltown.
13. Battle of Frenchtown.
13. Capture of Ogdensburg.
13. Battle of Stony Creek.
13. Battle of Lake Erie.
13. Battle of Moraviantown.
13. Battle of Chateaugay.
13. Battle of Chryslers Farm.
13. Capture of Fort Niagara.
14. Battle of La Colle Mill.
14. Fort Erie taken.
14. Battle of Chippewa.
14. Battle of Lundy's Lane.
14. Family Compact.
16. Common schools established in Upper Canada.
25. Miramichi fire.
33. "Royal William," first steamboat crossed the Atlantic from Quebec.
37-38. Papineau's Rebellion.
37-38. Mackenzie's Rebellion.
41. Upper and Lower Canada united.
42. Ashburton's Treaty, settling boundary dispute.
58. Capital removed to Ottawa.
58. Atlantic Cable laid.
64. Quebec conference.
66. Fenian invasion.
67. Confederation formed and Dominion proclaimed.

Dominion of Canada

67. Original Confederation.
Ontario, area 260,862 Sq. M.
Quebec, " 351,873 Sq. M.
Nova Scôtia, 21.428 Sq. M.
New Brunswick, 27,985 Sq. M.
Lord Monck, first Governor-general.
69. Red River Rebellion.
70. Northwest territories added to Dominion.
70. **Manitoba** admitted.
70. Fenian raid.
71. Treaty of Washington.
71. **British Columbia** admitted.
71. First Dominion Census.
Pop. four provinces, 3,485,761
Manitoba, 18,995
British Columbia, 86,247
Prince Edw. Island, 94,021
Total, 3,635,024
73. **Prince Edward Island** admitted.
76. Keewatin Territory created; area 470,416 sq. miles.
77. Halifax fisheries award.
80. All British America except Newfoundland annexed to Dominion.
82. Districts of Assiniboia, Saskatchewan, Alberta and Athabasca created.
85. Saskatchewan Rebellion.
85. Canadian Pacific Railway completed.
95. Districts created from unorganized territory.
Ungava, area 354,961 Sq. M.
Franklin, " 500,000 Sq. M.
Mackenzie, " 562,182 Sq. M.
Yukon, " 196,976 Sq. M.
97. Behring Sea award, $464,000.
98. Yukon made a territory.

1900

01. Decennial Census of British Empire. Population:
Eng. and Wales . . 32,526,075
Scotland 4,472,000
Ireland 4,456,546
Islands 150,599
India 294,266,701
Canada 5,369,666
Australia 5,000,000
Other portions . . 51,417,629
Total, 397,659,216
01. Duke and Duchess of Cornwall visit Canada.
01. Australian Federation completed.
02. Death of Earl of Dufferin.
02. First message by Pacific cable from Australia.
03. Alaskan boundary settlement.
03. Grand Trunk Pacific Railway 5,000 miles long projected.
04. Great fire in Toronto.
04. Dominion exhibition in Winnipeg.
04. Great fire in Winnipeg.
04. Earl Grey appointed Governor-general.
04. Miles of railway in Dominion, 19,611.
05. Government defeated in provincial election.
05. Provinces of Alberta and Saskatchewan created out of Northwest territories.
08. Government sustained in important elections involving railway and development policies.
11. Borden elected Premier.
11. Duke of Connaught appointed Governor-General.
12. Boundaries of Manitoba, Ontario, Quebec and Northwest Territories enlarged; Ungava, Franklin and Mackenzie absorbed.

France

Louis XV.
Peace of Vienna.
Peace of Aix-la-Chapelle.
Peace of Paris.
Louis XVI.
Peace of Versailles.
The Revolution.

Various Countries

-48. War of Austrian Succession.
Frederick II. the Great.
Seven Years' War.
Catherine I., Russia.
Elizabeth, Russia.
War between France and Poland.
Napoleon invaded Italy.

England

05. Battle of Trafalgar.
07. Slave trade abolished.
08. Peninsular War.
14. Peace with France.
15. War with Napoleon renewed.
20. George IV.
29. William IV.
37. Victoria crowned.
54. Crimean War.
57. Mutiny in India.
67. War with Abyssinia.
97. Queen's diamond jubilee.
99. Boer War.

Various Countries

04. Bonaparte, emperor.
04. Francis II. of Austria.
14. Louis XVIII. of France.
15. Waterloo. Napoleon overthrown.
48. Hungarian War. Francis Joseph of Austria.
52. Napoleon III.
61. Alexander II. of Russia emancipates serfs.
70. War between Germany and France.
71. William I., Emperor of Germany.
71. Republic of France.
88. Frederick III. of Germany.
88. William II. of Germany.
94. China-Japan War.
98. Spanish-American War.

England

01. Victoria died.
01. Edward VII., King.
02. Boer War ended.
10. Edward VII. died. George V. King.
10. South African Union formed.

Various Countries

04. Construction Panama Canal undertaken by the United States.
04-5. Russo-Japanese War.
06. Revolt in Russia.
06. First Russian Douma elected and convened.
06. Destruction of San Francisco by earthquake and fire.
08. English troops evacuate Tibet after occupation of four years.
08. Bulgarian independence declared.

from here. Its principal manufactures are iron castings, chemicals, wall-paper, leather, silk, caskets and leadpencils. It also has brickyards and carries on shipbuilding and repairing. The Stevens Institute of Technology, located here, is one of the best in the United States. Hoboken has excellent public and parish schools, an academy (the Sacred Heart), many fine churches, hospitals etc. It has ferry connection with New York, and electric lines run between Hoboken and several cities and towns of New Jersey. The city has the service of three railroads. Population 70,324.

Hob'son's Choice is a phrase which owes its origin to a man named Tobias Hobson, who was the first person in England who kept a livery-stable. He owned 40 horses, and politely offered his customers their choice, but always managed to give the traveler the horse nearest the door. Hobson's choice thus means an apparent choice only. The story is told in *The Spectator.*

Hochkirch (*hōch'kirch*), a village in Saxony, memorable on account of a battle between the Germans under Frederick II and the Austrians under Marshal Daun, on Oct. 14, 1758, during the Seven Years' War. Frederick lost 9,000 men and 101 cannon, and the Austrians lost 6,000 men.

Hog. See SWINE.

Ho'garth, William, a celebrated painter, engraver and pictorial satirist, was born at London on Nov. 10, 1697; served an apprenticeship to a silversmith; and studied art at Sir James Thornhill's school in James Street. About 1720 he set up for himself, first being employed in engraving coats of arms, crests etc. and in designing plates for booksellers. He made the illustrations for Gray's edition of Butler's *Hudibras.* He secretly married the daughter of Sir James Thornhill in 1729, and in 1730 began the painting of his satires, among them being *Harlot's Progress, A Midnight Modern Conversation, A Rake's Progress, The Distressed Poet* and his masterpiece, the famous *Marriage à la Mode.* He died at London on Oct. 26, 1764.

Hohenlinden (*hō-en-lĭn'den*), a small village in upper Bavaria, famous on account of the battle between the French and Austrians on Dec. 3, 1800. The Austrians lost 17,000 men and 74 guns, and the French loss was 5,000 men.

Hoh'enlo'he, Prince Clodwig Karl Victor, German chancellor and prime minister of Prussia, was born on March 31, 1819, was educated at Göttingen, and in 1845 became a member of the Bavarian parliament. After serving as ambassador of the kingdom at the papal, Italian and Greek courts, he entered the house of peers in 1870, and after the close of the Franco-German War he was a member of the first imperial parliament. Three years later he was made ambassador to France, and was a member of the congress of Berlin in 1878. He entered the reichstag the same year. In 1885 he was made governor of Alsace-Lorraine, retaining that post until 1894, when he was made chancellor of the German empire and Prussian prime minister. He resigned in October, 1900, and died in 1901.

Hohenzollern (*hō' ĕn-tsôl-lĕrn*) **House of,** the family of the present emperor of Germany, was founded by Count Thassilo in the beginning of the 9th century, and has continued in an unbroken chain to the present day to rule over Brandenburg, furnishing the kings of Prussia since 1701 and the emperors of Germany since 1871. Hohenzollern is now a province of the empire, encircled by Baden and Württemberg; area 441 square miles and population 68,282.

Holbein (*hôl'bīn*), **Hans,** the younger, one of the most celebrated of painters, was born at Augsburg, Germany, in 1497; and died in 1543. His father, Hans Holbein the elder, also was a well-known painter. The best of his early works was the altarpiece for the monastery of St. Catherine, painted in 1515-16. About this time Holbein went to Basel, and four years later made it his home. In 1522 was painted his *Madonna and Child,* one of the best of this master's pictures. In 1526 or 1527 he visited England, met Sir Thomas More, and began his great series of portraits of the leading Englishmen of the day. Among the most notable of these are *Archbishop Warham* and *The Family of Sir Thomas More.* Three years later he was again in Basel, painting on the walls of the council-hall *Rehoboam, Samuel and Saul* and *Hezekiah.* In 1532 he again visted London, and among his pictures of this period is the famous group, *The Ambassadors.* He became royal painter to Henry VIII, and painted portraits of the king, Jane Seymour and others of the court. Holbein is at his highest in his portraits. Here his power of expression, truth and richness of color rank him with the greatest masters. See R. N. Wornum's *Life and Works of Holbein.*

Hol'land, The Netherlands, is a kingdom lying west of Prussia and on the southern shores of the North Sea. Its dimensions are 195 miles long and 110 miles broad, covering an area of 12,648 square miles. It is divided into eleven provinces, with a total population of 5,898,429, which makes it a very densely settled country. The land is covered with a network of canals, used for irrigation and transportation; yet, the land being in the main much below the level of these artificial streams and of the sea, all are bordered by high dikes or embankments, serving the double purpose of preventing overflows and, being broad and smooth on the top, of carriage-roads and footpaths. During the winter months these canals, being icebound, are used by skaters. Large windmills are used to pump out any extra water, and these mills, with their great sails, are seen everywhere in Holland. In climate it is much like England.

Possessions. Holland has an area of 783,000 square miles in her colonies, with a population of 36,000,000. The East Indian possessions include Java, Sumatra and parts of Borneo and New Guinea; and the West Indies, Surinam, Curaçoa and Dutch Guiana.

Natural Resources. Some coal is mined, and the fisheries trade is very large. Nearly five thousand vessels and twenty thousand seamen are thus engaged, and the herring and oyster yield is of great value.

Agriculture. While there is a scarcity of farmland, the Hollander is a skillful and thrifty farmer, and the agricultural output consequently is very large. Rye, oats, potatoes, wheat, barley, beans, beet-root, buckwheat, peas, rapeseed, carrot-like plants for forage and tobacco are produced. Poultry, cattle-raising and dairy-farming are the chief industries of the Dutch farmer, and the cheese and butter output is enormous. Much attention is given to bee-culture and to the raising of flowers, bulbs and flower-seeds.

Manufactures. The chief manufactures are linen, cotton, woolen and silk fabrics; paper, leather, glass etc.; and lately refining beetsugar has formed an important item. There are 28 beetsugar refineries, 13 sugar refineries, 88 vinegar manufactories, 37 saltworks, 536 distilleries and 471 breweries. Amsterdam has had the largest diamond-cutting trade in the world.

Education and Religion. Denominationally the Hollanders belong, in the main, to the Dutch Reformed and the Roman Catholic church, though there are about 100,000 Jews. The nation has four universities, about 30 classical schools, more than 3,000 public and 1,630 private elementary schools.

Army and Navy. The peace strength of the army is usually 1,836 officers and 32,714 noncommissioned officers and men. The navy consists of eight small battleships and seven cruisers, and seamen and marines are recruited by enlistment.

Transportation and Imports. At present the total length of the canals is over 1,900 miles; while there are 1,984 miles of railway, besides 4,680 miles of telegraph lines. The imports at times amount to more than 3,260,000 *guilders*, and the exports have totalled 2,632 million *guilders.* (The *guilder* is worth about 40 cents.)

History. What now is Holland was occupied by the Frisians about 150 .B C. They were afterward subdued by Drusus, and Holland south of the Rhine remained under the Roman empire until the 4th century, when it succumbed to the Franks. In the 8th century it submitted to Charlemagne, when the duchy of Flanders was shortly afterward founded. Charles V of Spain, coming into power over the Netherlands, made the country one of great importance, but under his son, Philip II, the Dutch began a revolt, which lasted for eighty years before the Spanish yoke was finally thrown off, their deliverer being William of Orange, known as William the Silent. Until 1713 Holland was a power in Europe, but in that year its decline began, until now it is but a small nation, without voice in matters of diplomatic weight, living on its former glory and greatness. Holland in the 16th century was one of the great powers in Europe. Her ships were met with everywhere, and carried most of the world's trade. Amsterdam was the Venice of the north, and was early a banking exchange for Europe. The first optical instruments and the pendulum clock came from Holland. The art of printing was here carried to a high degree, and the liberty of the press led to the establishment of many newspapers, some of which were printed in French and sent all over the world. Her power was crippled by England in the great naval war of 1652–54 and by France, under Condé and Turenne, in the reign of Louis XIV. When William III became king of England, he protected Holland from France and secured the treaty of peace. The 18th century, however, was the century of Holland's decay. In 1794 the armies of France overran Belgium, and the United Provinces became the Batavian Republic, paying a large amount for a French army. In 1806 Louis Bonaparte was made king of Holland, and four years later it was added to the French empire. On the fall of Napoleon the Orange family were recalled and the kingdom of the Netherlands was formed, from which Belgium seceded in 1830. The capital is The Hague, and the queen is Wilhelmina, the daughter of William III of Holland. She was born in 1880, and is one of the youngest sovereigns in Europe. The regent during her minority was her mother, Queen Emma, who was assisted by a council of guardians. Wilhelmina in 1901 married Prince Henry of Mecklenburg-Schwerin. The chief towns are Amsterdam (568,130), Rotterdam (417,780), The Hague (270,109) and Utrecht (118,386). The Netherlands is a free-trade country. See *Rise of the Dutch Republic* by Motley; *Picturesque Holland* by Havard; and *Philip II of Spain* by Prescott.

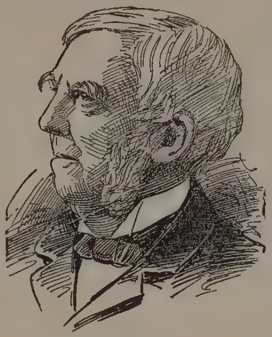
Holland, Josiah Gilbert, an American writer, was born at Belchertown, Mass., July 24, 1819. He studied medicine and practiced for some three years, and then became superintendent of public schools at Vicksburg, Miss. He was connected with the *Springfield Republican* from 1849 until 1866. He was one of the founders of *Scribner's Magazine* in 1870, and remained editor of it and of *The Century Magazine* until his death. He was a prolific author, and all his books were of a high moral tone. Some of the best known are *Bitter-Sweet; Gold Foil; Arthur Bonnicastle; The Story of Sevenoaks;* and *Nicholas Minturn.* He died at New York, Oct. 12, 1881.

Hol'ly, species of the genus *Ilex*, which contains about 175 species distributed throughout the world. They are ornamental shrubs with evergreen or deciduous and sometimes spiny leaves and black, red or yellow berries, which remain on the shrubs until the following spring. In this country holly is most abundant on the bottom-lands of the streams of eastern Texas and southern Arkansas, but occurs on the Atlantic coast from Massachusetts to Florida; and in the valley of the Mississippi it is found from southern Indiana to the Gulf, in Mississippi and in Louisiana. The hollies with scarlet or red berries are regarded as the most ornamental, and the branches of *I. opaca* and *I. aquifolium* bearing red berries are in large demand for Christmas decoration. *I. opaca*, known as the American holly, is a tree sometimes 50 feet high. *I. aquifolium* is a favorite evergreen shrub in English gardens, and there are numerous varieties of it in cultivation, known as the European holly. It is native to Europe and Asia.

HOLLY

Hol'lyhock, an old garden-plant (*Althæa rosea*) belonging to the mallow family. Numerous varieties of it have been developed, and it is one of the treasured "old-fashioned flowers." It comes originally from Syria. The double variety is taking the place formerly held by the single one and shows a wide range of color.

Holmes, Oliver Wendell. With our reading-tables crowded with periodicals of rich and varied contents and of wide circulation, it is difficult to realize that the launching of a literary magazine in the United States, fifty years ago, was looked upon as a hazardous undertaking. Public taste and confidence would have to be cultivated, and contributions, it was feared, imported. Where was *The Atlantic Monthly* to look for writers? Of poets we had a goodly number, and Lowell was to edit the magazine. But of prose-writers, Hawthorne was abroad in the consular service and was writing very little, and Washington Irving was within two years of his death. A number of younger writers had still to win their spurs. In this emergency Lowell appealed to Dr. Holmes, a Boston physician and medical lecturer at Harvard.


OLIVER W. HOLMES

Born in Cambridge, Mass., Aug. 29, 1809, Oliver Wendell Holmes was forty-eight years old. When in college more than a quarter of a century before, he had won fame over-night by writing *Old Ironsides*, a poem that got into the school-readers and saved the *Constitution* from destruction. He still wrote verse occasionally, and he had local celebrity as a conversationalist. His drawing-room talk and classroom lectures were said to be good enough to print. Lowell declared boldly: "The success of this magazine rests with Dr. Holmes. He has written little, but you'll see. His mind is like a bright mountain stream that has been dammed up in the hills, waiting only an outlet to the ocean. He has a wonderful store of thought — serious, comic, pathetic and poetic." The prediction was verified in that delightful series of essays, *The Autocrat of the Breakfast Table*. Nothing so wise, so witty, so humorous, so kindly, so philosophical, had been produced in America. English critics declared he had the flavor of Montaigne, the sweetness of Goldsmith, the high-bred fancy of Leigh Hunt and a moral freshness all his own — a boy-heart, unsullied, in a manly breast, beating true under a poet's robe.

The place he thus gained in the world of letters he continued to hold unchallenged to the day of his death, in October, 1894, at the age of eighty-five. *The Professor at the Breakfast Table* soon followed; then *Elsie Venner, The Guardian Angel, The*

Poet at the Breakfast Table, *A Mortal Antipathy* and *Over the Teacups*. In the breakfast-table series were included poems that have taken their place among American classics: *Dorothy Q*, *The Last Leaf*, *The Voiceless* and *The One-Hoss Shay*. *The Chambered Nautilus* ranks among the highest productions in English verse. Dr. Holmes' achievements in literature are all the more remarkable for the fact that writing was never his main business in life. Until he was seventy-three he continued to fill his professorship at Harvard. He took care of a large private practice, wrote medical treatises, and made many original scientific investigations. Essays, novels, poems were simply the by-product of a richly stored mind and heart. A merry, restless little fellow of varied interests and tireless energy in boyhood, he never outgrew a certain youthfulness in appearance and in his outlook on life. In old age his interests ranged all the way from song to science, from theology to the college boat-races. If wise and witty, he also was warm and kind. If he pricked the bubble of the folly and conceit of society, he always dressed the wound with the ointment of tenderness and tolerance. While there is delight for the most fastidious in Holmes' writings, there never is any straining after effect in his flights of fancy, any assumption of superiority in his wisdom, any taint of cynicism in his humanity to chill or discourage the humblest. He must be a vain and empty man, indeed, who finds no food for thought or good cheer for the affections in our genial autocrat.

Holmes, Oliver Wendell, Jr., American jurist, son of Oliver Wendell Holmes, was born in Boston in 1841. He was educated at Harvard, graduating in 1861. He served in the Civil War, and was three times wounded. He afterwards studied law, won a practice in Boston, and from 1870 to 1873 was editor of the *American Law Review*. In 1882 he became professor of law at Harvard and in 1889 chief justice of the Massachusetts supreme court. In this position he was made quite famous among lawyers by his original decisions. In 1902 he became a Supreme Court judge of the United States. He is the author of *The Common Law* and several other legal works.

Holst, Hermann Eduard von, a Russian-German historian and teacher, was born at Fellin, Livonia, June 19, 1841. He was educated at Dorpat and Heidelberg. He came to the United States, engaging in journalistic and literary work in New York city. He was made professor of history at Strassburg University in 1872, and in 1874 was made professor of modern history at Freiburg. While holding this chair he revisited the United States and was a lecturer at Johns Hopklns University, and in 1892 was called from Freiburg to the chair of history at the University of Chicago. His principal work has been translated by J. J. Taylor and T. B. Mason under the title of *The Constitutional and Political History of the United States*. He was the author also of a *Life of John C. Calhoun* and *The Constitutional Law of the U. S. of America*. He died on Jan. 20, 1904.

Ho'ly Alli'ance, an international league formed at the instigation of Alexander I of Russia in 1815 and signed also by Francis of Austria and Frederick William III of Prussia. It nominally was for the purpose of binding together the Christian powers, and preserving them from the effects of any insurrections against the existing authority which the disturbing influence of Napoleon I had tended to encourage. Naples, France, Spain and Sardinia joined the alliance at a later date. In its name the rebellions in Piedmont and in Naples were crushed in 1823. By 1848 it had become a dead letter.

Ho'ly Ro'man Em'pire. See GERMAN EMPIRE.

Holyoke (*hōl'yōk*), **Mass.,** a busy, industrial city in Hampden County, on the Connecticut River, eight miles north of Springfield, in the western-central part of the state. Its 500 manufacturing establishments derive their chief water-power from an immense dam in the river, which is here bridged, connecting Holyoke with South Hadley Falls. Of its many industries, one of the chief is the manufacture of fine writing-papers, blank-books and stationery; there are, besides, many cotton and woolen, silk, thread, alpaca and knitgoods mills. School-supplies are manufactured as well as automobiles, bicycles and furniture. Belting, screw, wire, cutlery and machine shops give collective employment to many thousand artisans. Holyoke has a substantial city hall, a splendid library, a high school, two fully equipped hospitals and two orphanages just outside the city. It has excellent public, parish and evening schools and a college of music. Holyoke has fine waterworks, electric street railroads and the other useful adjuncts of a progressive city. Population 57,730.

Holyoke, Mt., a steep ridge of greenstone trap, well-timbered, about seven miles long, in Massachusetts. It is near the towns of Hadley, South Hadley and Amherst. The western end of the ridge is called Mt. Holyoke and the eastern Mt. Tom, the two being separated by the Connecticut. The highest point rises 1,120 feet. At the summit is an hotel where travelers may rest who have made the ascent. Near by, at South Hadley, is Mt. Holyoke College, founded in 1837, for the education of women. It has 85 female instructors and 718 students, and possesses a library, with 32,000 volumes, and considerable scientific apparatus

Homeo'pathy, a system of medicine or medical treatment, originally based upon the theory that the curative properties of drugs and medicinal agents are represented and illustrated by their effect upon a healthy person. The theory of homeopathy was first propounded by Dr. Samuel Hahneman about the end of the 18th century in Germany, and, though for some years it had few adherents, it has in later times gained a large following and a recognized place among reputable and scientific medical schools. The essentials in which homeopathy differs in practice from allopathy may be briefly stated. It condemns the commixture of several drugs in one prescription. When two or more medicines are required, they are given alternately, with a considerable interval between. It has always avoided as unnecessary and injurious the "heroic" treatments: blistering, blood-letting, severe purgatives, salivation by mercury etc. Particular attention is paid to diet, exercise, habits and other hygienic helps to recovery. It believes that doses given may be smaller than the old-fashioned practice made them. The first American homeopathic physician was Dr. Hans B. Gram, by parentage a Dane, who in 1825 practiced in New York city.

Ho'mer, the greatest name in epic poetry, has come down to us as, unfortunately, little better than a name, and many theories of the origin of the Homeric poetry hardly leave us even the name. The traditions agree in making Homer an Asiatic Greek, probably born at Smyrna about 850 B. C. He is represented as blind and as reciting his poems from place to place. All scholars agree that the poems were not written, but handed down from memory, as there is little evidence that in Greece writing was practiced at so early a period. One theory of their authorship is that they are the work or compilation of a company of poets or Homeric guild, who composed, collected and handed down in this form these legends of early history. The *Iliad* and the *Odyssey* are sometimes referred also to different writers and sometimes to early and later periods of Homer's genius. They are the greatest epics of any age; the *Iliad* is called the "beginning of literature." Tennyson called Homer "the Ionian father of the rest." The Trojan War is the event celebrated, and the story, if not strictly historical, is based on the real life of the people. The poems of Homer have been translated into all the languages of Europe, among the best English translations being those of Pope, Bryant, Butcher, Lang and Palmer. "You have given us a very pretty poem, Mr. Pope, but it is not Homer," said Evelyn or Pepys. See *Studies on Homer* by Gladstone and *Lectures on the Translation of Homer* by Matthew Arnold.

Homer, Winslow, an American artist, was born at Boston, Feb. 24, 1838. He obtained notice by two pictures entitled *Home, Sweet Home* and *The Last Goose at Yuletown.* He pursued his studies in Paris, and won recognition as an artist of originality. Among his pictures are *Prisoners from the Front; Eating Watermelon; Flowers for the Teacher;* and three marine paintings: *Northeaster; Stormbeaten;* and *Wood's Island by Moonlight.* The last gained the medal of honor at the exhibition of the Academy of Fine Arts at Philadelphia in 1896. His other successful work includes among genre subjects *Cotton Pickers, A Visit from the Old Mistress* and, in marines, *The Life Line, Launching the Boat* and *The Maine Coast*, the latter a remarkably fine production.

Home'stead Laws refer, in the United States, not to homes in general, but to family residences which are held under certain definite statutes and obligations. The purpose of these restrictions is to preserve the home as far as possible from falling entirely into the hands of creditors. The homestead laws, which are passed not by the state legislature but by the federal government, are directed rather towards encouraging the closer settlement of rural districts by means of grants of the public land made upon easy terms. The first federal act of this kind was passed in 1862; and since this time some 90,000,000 acres of the public lands have been divided for homesteads. Heads of families, or American citizens over 21 years of age, may be granted as much as 160 acres of public land on condition that the holder should agree to live upon it for five years, make certain improvements, and pay certain small registration fees. It seems to be historically true that the stoutest backbone which a nation can have consists of a large body of small landholders.

Although almost all the states have laws to exempt portions of the homestead property from being seized by creditors, it is not intended that these exceptions shall overthrow the rights of creditors according to the common law. The courts have a good deal of freedom, being allowed to decide according to the spirit and purpose of the homestead laws and the common law. The amount of property which may be exempted commonly varies from 80 to 160 acres of land, and from $1,000 to $2,000 worth of improvements and personal property.

Homestead, Pa., a manufacturing borough in Allegheny County, on the Monongahela River, seven miles southeast of Pittsburg and on the Pennsylvania and Pittsburg and Lake Erie railroads. It is the focus of extensive iron, steel, glass and firebrick works and foundry products, its chief establishment being the mammoth plant of the U. S. Steel Corporation. Here, in the summer of 1892, there was a menacing industrial outbreak which necessitated the calling out of the National Guard of the state to suppress it. Population 18,713.

Home, Sweet Home. The words of this favorite song were written by John Howard Paine. The melody to which they are set may be of Sicilian origin. It is commonly ascribed to Sir Henry Rowley Bishop (1786-1855) in whose opera of *Clari or the Maid of Milan* it occurs.

Homos'pory (in plants), a term which implies that the asexual spores produced by a plant are similar. All plants except spermatophytes (seed plants) and some pteridophytes (fern plants) are homosporous. Isospory is a synonym, and heterospory is the contrasting term, which see.

Hondu'ras, the third largest republic of Central America, lies between Nicaragua, San Salvador and Guatemala, having a coast line of 400 miles on the Caribbean Sea and about 50 miles on the Bay of Fonseca, an arm of the Pacific. Its area is about 46,250 square miles, and the population 553,446. Little or no attention is paid to agriculture, its chief wealth being in mineral products, as gold, silver, iron, copper, platinum, zinc, tin and lignite. The republic has 13 states or departments, is governed by a president assisted by six ministers, and the laws are made by a congress of 37 deputies. It was discovered by Columbus in 1502, and threw off the Spanish yoke in 1821. There is a railroad from Puerto Cortez to San Pedro Sula, thence to La Pimienta, 60 miles. See *Honduras* by Squier and *The New Honduras* by Lombard. The capital is Tegucigalpa (population 34,692); the other chief towns are Juticalpa (population 17,808), Nacaome (12,040), La Esperanza (11,453) and Santa Rosa (10,888). The main ports are Amalpa on the Pacific and Puerto Cortez, Omoa and Trujillo (Truscillo) on the Caribbean. The exports embrace mineral ores, including gold and bar silver, together with rubber and coffee. Exportation and importation are carried on chiefly with the United States.

Honduras, British, a crown-colony of Britain on the Caribbean Sea, south of Yucatan and 660 miles from Jamaica. Its area is 7,562 square miles; with a population of about 40,372, chiefly colored. Its chief exports are mahogany, logwood, sugar, coffee, plantains, bananas and cocoanuts. Principal town, Belize (population 9,113).

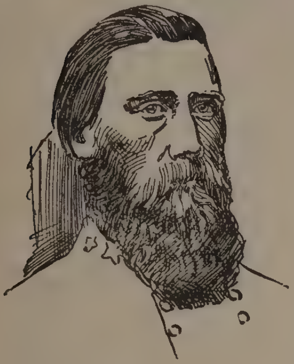
Honey (*hŭn'ȳ*), a very sweet, thick liquid made by bees and some other insects. The bees gather the nectar or sweet juice from flowers and carry it to the hive, where it is changed into honey and the cells of the honeycomb filled with it. Different flowers give different flavors and color to the honey. Clover honey is white, while heather honey or buckwheat honey is dark. The honey of Hymettus, a mountain in Attica, was held in high esteem, probably because of the flavor of wild thyme, which grew there abundantly. Honey is used as food, in the preparation of medicines and in the manufacture of some kinds of ale. It is sold in the comb and also as "strained honey." In this form it is sometimes adulterated with glucose. It is not unhealthy but is less sweet than pure honey. The annual production of honey in the United States is more than 60,000,000 pounds.

Hon'eysuck'le, species of the genus *Lonicera*, which contains nearly 150 species distributed throughout the northern hemisphere, more than 60 of which, in addition to numerous hybrids, are in cultivation. About 25 species are native to North America. The honeysuckles either are dwarf or climbing shrubs, always with opposite and entire leaves and tubular flowers, which are white, yellow, pink or scarlet and often fragrant. One of the most common climbers is *L. sempervirens*, the trumpet honeysuckle, with scarlet or rarely yellow flowers.

Hong'-Kong' or **Hong-Kiang** ("sweet waters"), an island belonging to Great Britain, the center of British commerce with China and Japan and an important naval and military station of that power, is on the east side of Canton River in the south of China. It has an area of 29 square miles, and, for the most part, is rocky and barren. Its beautiful harbor, one of the finest in the world, ten miles square, makes it the principal commercial station of eastern Asia, the aggregate value of exports and imports exceeding $200,000,000 per year. Its imports, which are chiefly from Great Britain, consist mainly of cottons and cotton-yarn, woolens, iron, coal, copper and machinery. Its exports are tea, silk, drugs and hemp. Hong-Kong formerly was part of China, and was first ceded to Great Britain in 1841. The population in 1911 was 456,739. Britain has now secured some territory inland (Kowloon), an area of 376 square miles, the population of which is here included. This is diplomatically known as the Kaulung Hinterland. The capital is Victoria.

Honolulu (*hō'nō-lōō'lōō*), the capital (population 52,183), of the Hawaiian or Sandwich Islands, which in 1898 were annexed to the United States and attached for military purposes to the department of California. This city is situated close to the southwestern coast of Oahu (See HAWAII). The islands were, on June 14, 1900, constituted as the territory of Hawaii, after an act had been passed declaring the inhabitants to be citizens of the United States and of the Territory of Hawaii. Honolulu has electric street railways and is lighted with electricty. There are railways on the island, and there is cable communication with San Francisco, the line having been opened on Jan. 1, 1903. Nearly every family in Honululu, it is said, has its telephone — so amply equipped is the city.

Hood, John Bell, an American soldier, was born at Owingsville, Ky., June 1, 1831. He graduated from West Point in 1853, and served in the United States army in Texas and elsewhere on the frontier. When the Civil War began, he resigned and entered the Confederate service, in which he rose to the rank of lieutenant-general He was wounded at Gaines' Mill, Gettysburg and Chickamauga, where he lost a leg. He commanded a corps under Gen. Joseph E. Johnston in the Atlanta campaign, 1864, and succeeded Johnston in command of that army. Compelled to evacuate Atlanta after desperate fighting, he moved on Sherman's communications, fought a losing battle at Franklin, Tenn., but pushed on to Nashville, where he was disastrously defeated by Gen. Geo. H. Thomas on Dec. 16, 1864. At his own request he was then relieved of his command. His book, *Advance and Retreat*, was printed after his death, which occurred at New Orleans on Aug. 30, 1879.


GENERAL JOHN B. HOOD

Hood, Robin, an English bandit, celebrated in song and poetry. He is spoken of by almost every English poet. He is supposed to have been the last of the Saxons and to have lived about the close of the middle ages. He was brave, good-hearted and generous; his arrow never missed fire; and what he took from the rich he gave to the poor.

Hood, Thomas, an English poet, was born at London, May 23, 1798. His autobiography, *Literary Reminiscences*, tells us that until 13 years of age he was educated by two maiden ladies, and afterward all he knew he acquired without tutors. Showing some literary genius, he was made assistant-editor of the *London Magazine*, and this association developed his talents. His first poems attracted no attention, and it was not until the appearance of *Eugene Aram* that full recognition was accorded him. His writings were exceedingly numerous, so much so that many are without merit; but his lyrics, as *The Song of the Shirt*, the *Bridge of Sighs* and the *Ode to Melancholy* will never die. He was remarkable for his powers of punning, a power that in his hands was put to many new uses. He died at Devonshire Lodge, London on May 3, 1845.

Hook'er, Joseph, an American general, was born on Nov. 13, 1814, at Hadley, Mass., and graduated from West Point in 1837. He served in the Mexican War, reaching the rank of captain. He left the army in 1853, but in 1861 again offered his services. His bravery in the battles of the Peninsula won him the title of Fighting Joe. He took part at South Mountain, Antietam, Manassas, Fredericksburg and Chancellorsville; carried Lookout Mountain; and was with Sherman in his invasion of Georgia. He had command of the Army of the Potomac in 1863, but was superseded by Meade shortly after his defeat at Chancellorsville. In March, 1868, he retired with the rank of major-general in the regular army, and died on Oct. 31, 1879.

Hooker Thomas, a clergyman, born in Leicestershire, England, in 1586, after studying theology at Cambridge University and attracting great attention as a lecturer and preacher, came in 1633 to America. He had been cited before Archbishop Laud and threatened with the judgment of the Court of High Commission because of his Puritan tendencies. Hooker spent three years preaching in Holland prior to his emigration to New England. He became one of the two most famous of New England ministers; the other being John Cotton, who sailed to America on the same ship with Hooker. Hooker was not only a ready writer of sermons, but evidently a man of great organizing ability. He was pastor at Newton, now Cambridge, Mass., but in 1636 he removed with one hundred others to found a new settlement in what is now Hartford, Conn. Hooker is the true pioneer of the colony of Connecticut. Moreover, in 1869, Hooker went with Governor Haynes to an important consultation with Governor Winthrop, out of which came the first American union, the United Colonies of New England. Hooker died in 1647.

Hooke's Law describes an important phenomenon of elasticity, namely, that when a rod or wire of any material is stretched by a force, *the elongation of the wire varies directly as the force.* This law, which was discovered by Robert Hooke in 1675, holds only for those cases in which the forces are not so great as to exceed the limits of elasticity of the material. Hooke's law is now employed in a still more general sense to mean that the ratio of *stress* to *strain* is, within limits, a constant for all kinds of strains. See ELASTICITY.

Hoo'sac Tunnel, a tunnel of the Fitchburg Railroad built through Hoosac Mountain, one of the Green Mountains in western Massachusetts, is five miles long and is the most notable tunnel in the United States. It was begun in 1851, twice abandoned, but was completed in 1875 after costing Massachusetts about $18,000,000.

Hop, species of *Humulus*, a genus belonging to the nettle family. It contains two or three species of twining vines, with rough, palmately-lobed leaves and cone-like catkins, which, increasing much in size, are the so-called hops. The common hop is *H. lupulus*, which is native to both Europe and North America, and has long been cultivated for the hops that are used in the brewing of beer and in the manufacture of yeasts. For commercial use the hop is extensively cultivated, the handling of the crop consisting in removing the catkins and carefully drying them. The crop in the United States in 1910 amounted to 44,000,000 pounds, Oregon alone producing 18,000,000 pounds.

Hop'kins, Johns, an American philanthropist, was born in Anne Arundel County Md., May 19, 1795. A large part of the fortune which he accumulated in business he devoted to various philanthropies. He gave $4,500,000 for the founding and equipment of a hospital at Baltimore, stipulating that the institution be free to all, regardless of race or color. By his will he devoted $3,500,000 to the founding of Johns Hopkins University at Baltimore, now one of the most complete and efficient of modern educational institutions. He established an asylum for negro orphans and gave a public park to the city. He died at Baltimore, Dec. 24, 1873.

Hopkins, Johns, University. See UNIVERSITIES.

Hopkins, Mark, an American educator, was born at Stockbridge, Mass., Feb. 4, 1802. He graduated at Williams College in 1827, and studied medicine, but, fortunately for the college and her many students, accepted the professorship of moral philosophy in Williams College in 1830, where he remained until his death in 1887. He served the college as president from 1836 to 1872, making a model college president and teacher and one of the best known in the United States. Garfield, one of his pupils, said: "A log with a student at one end and Mark Hopkins at the other was his ideal college." He was prominent in all church and educational bodies, acting as president of the American Board of Foreign Missions for nearly thirty years. His *Evidences of Christianity* and *Law of Love and Love as a Law* have been extensively used as textbooks. He died at Williamstown, Mass., June 17, 1887.

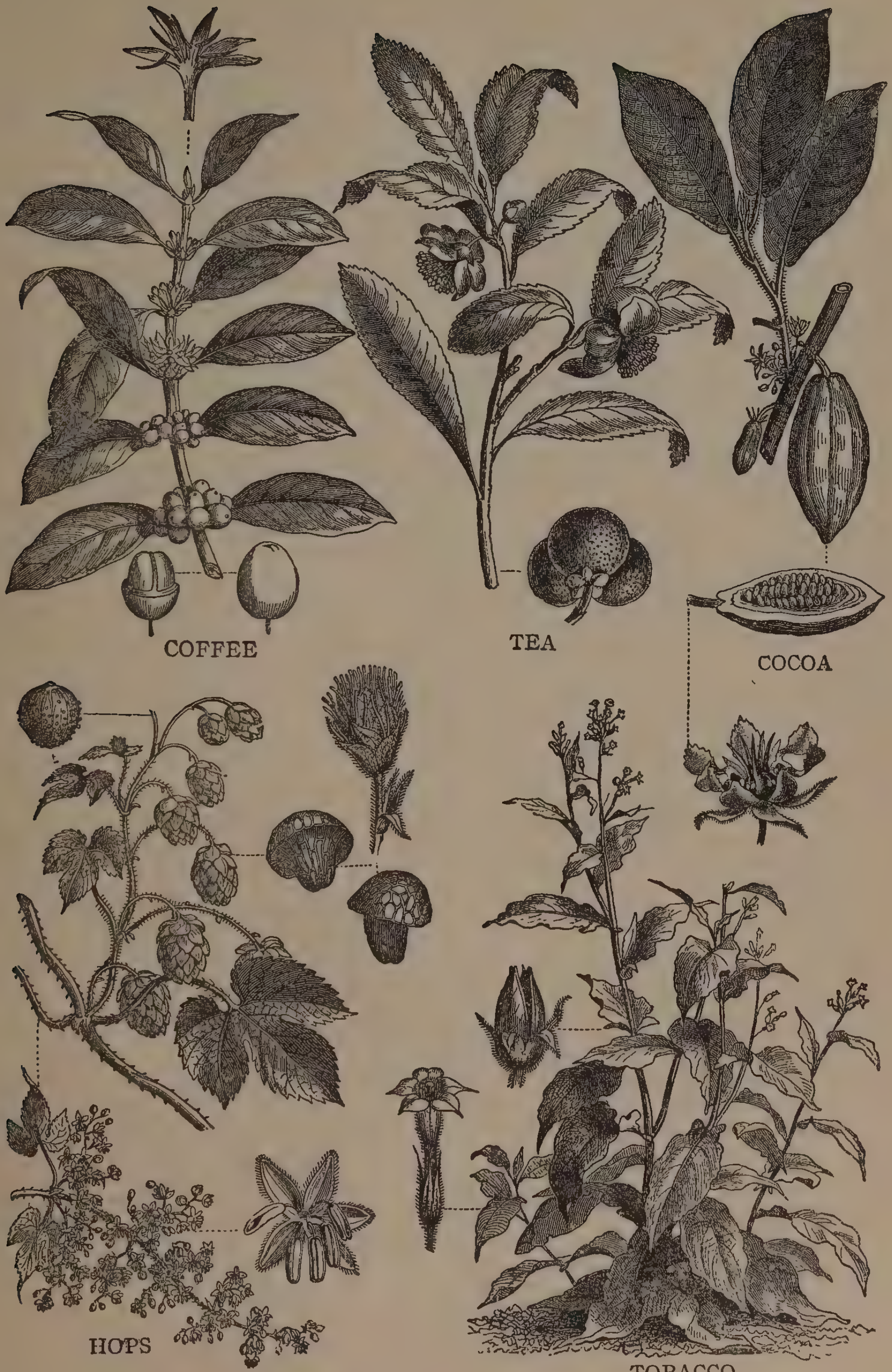
Hor'ace, Quintus Horatius Flaccus, a Latin poet, born in southern Italy on Dec. 8, 65 B. C., was the son of a slave freed by his own labors. He received a fine education, proceeded to Athens to finish his studies, and while there joined the forces of Brutus. After the defeat at Philippi he returned to Italy, and was forced by poverty to make verses. He attracted the attention of Vergil, who introduced him to Mæcenas, the minister of Augustus, the Roman emperor, who raised him from poverty to wealth, Horace becoming poet-laureate. He died on Nov. 27, 8 B. C. Among his works are *Satires* (eighteen in number), *Odes* and *Secular Songs*. The *Satires* were published in 35 B. C. and a second volume in 30 B. C. His greatest works are the *Odes*, written at the age of forty-six, and the *Epistles*. The last of the *Epistles*, the *Art of Poetry*, was left unfinished. His works have been read by a hundred generations of schoolboys, and have supplied more proverbial phrases than all other Latin literature. He almost was the last of the great Latin poets. See *Life of Horace* by Milman.

Hora'tius. Horatius Cocles was a Roman hero, descended from the Horatii who defeated the Curiatii of Alba Longa in Rome's early struggle with that city. Horatius with Spurius Lartius and Titus Herminius held the entrance to the bridge over the Tiber against the attack of the army of the Etrurian king Lars Porsena, while their countrymen hewed down the bridge in their rear. Lartius and Herminius crossed on the bridge to the Roman side just before it collapsed; Horatius, finding himself alone with the hostile army in front and the foaming Tiber behind him, bravely plunged into the swift-flowing river, though clad in full armor, and swam safely to the opposite bank, greatly to the rejoicing of his fellow countrymen. Horatius has been widely popularized as a hero by Macaulay's poem in the *Lays of Ancient Rome*.

Ho'reb, Mt. See SINAI.

Horn, the name, in a general sense, applied to the hard bone-like substance growing from the heads of animals. Horns are of two kinds: one being a continuation of growth of the actual bone structure and the second being a hardening of the epidermis or skin. They may be solid or hollow; the hollow horn being but a single column, as a rule; the bony or solid horn is usually branched or pronged. The name is also applied to the nails, hoofs, claws, bills and quills of animals. Horn is manufactured into many articles of use and ornament, and has been so used from the earliest period. Thin plates of horn were once used for window-panes, lanterns and book-covers, whence the name hornbook. It is used in making handles for knives, forks, umbrellas and canes; for combs, buttons, drinking cups, snuff and other boxes. The horn in its natural form has been largely used for holding powder, many powder-horns being beautifully carved.

Hor'ned Toad, a lizard inhabiting the dry sandy plains of the western United States.


COFFEE
TEA
COCOA
HOPS
TOBACCO

The scales of the body are spiny or granulated, and the head is provided with several sharp spines. The animal is not a toad, but a true lizard.

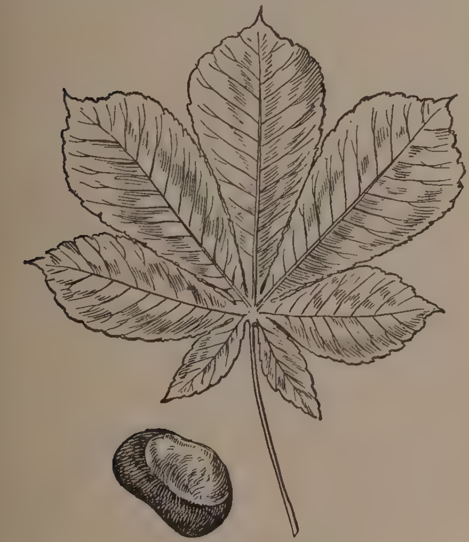
Hor'nell, N. Y., a city of Steuben County, on Canisteo River in southwestern New York. It lies 58 miles south of Rochester and 93 southeast of Buffalo, on the Pittsburg, Shawmut and Northern Railroad and at the junction of the Western and Buffalo divisions of the Erie Railroad. The latter of these railroads has large machine shops here. Hornell's industries include boot and shoe shops; factories for the tanning of leather; dynamo and electric motor works; wire-fencing, door, sash and blind manufactories, brick and clay works, furniture and large silk-mills. In the latter industry it ranks next to Paterson, N. J., and in the making of office trimmings and furniture its operations extend abroad, for shipments are made to London, England, and an office is established there. Hornell, formerly Hornellsville, had its name changed by legislative act in 1906. It has good schools, churches, a public library and three banks. Population 13,617.

Hor'net, a species of wasp found in Great Britain and America, is usually brown or brownish red, marked with yellow, and is about an inch long. The white-faced hornet usually builds in trees, the nest sometimes of enormous size. Hornets are ancient and famous paper-makers. Their paper dwellings are waterproof, and consist of many chambers. The paper is chiefly made of decayed wood, which they manufacture by macerating it with their mouths; moss and other substances are also employed. In building, a worker flies from the nest and shortly returns with a ball of fibre; this she will turn about and about, chewing it until it is of the desired consistency. Then she goes to work to apply it to the structure, shaping the bit of paper with her mandibles. The builders patiently go over their work, retouching and strengthening the terraces of cells,— a monument of patience. After the inner cells are completed, they make a roof-covering, providing protection from weather, birds and other enemies. A hole in the bottom gives exit and entrance; through this spiders, flies and other small insects are brought in for the hundred and more hungry mouths waiting to be fed. At the end of the season a hornet's nest is nearly or quite empty. In winter all die save a few females, who, after a period of sleeping in secluded nook in house or garden, will come forth in the spring to begin nestbuilding and the starting of a new colony. The female builds a few cells, lays eggs therein, from these develop workers, which will help her in building, feeding and other cares of the nest. Hornets are insectivorous. Their formidable jaws are their weapons, and they prey upon flies and butterflies, waylaying the home-going honeybee to take her honey. Spring and summer they include in their food the sweets of flowers, and show a liking for fruit — as the housewife can bear witness on canning day. They are great fly-hunters, sometimes entering houses and catching these household pests. It is frequently declared that hornets will not sting unless meddled with, but when disturbed they assuredly bear out their reputation for ferocity. The hornet is so called because of its antennæ or horns, horn-bearer. The white-faced hornet gave to man the suggestion of making paper from wood-pulp. See Wasps. Consult *Scientific American Supplement*, Dec. 30, 1905, and "Two Little Paper-Makers" in *The Chautaquan* for 1902 (Vol. 35).

Horse, a common domestic animal having a solid hoof and only one toe developed on each foot. The horse, ass, zebra and quagga form a natural family separated from all other families of mammals. The single toe and solid hoof are not possessed by any other living animals. Horses are grass and grain eaters, but do not chew the cud. The horse has horny patches, called chestnuts, on the inside of both pairs of legs — just above the knee on the fore limb and below the hock on the hind limb. The horse has relatively small ears, a mane and a tail of long coarse hair. The long hairs of the tail grow from the base as well as the sides and tip, while the tails of the ass and zebra are tufted on the end. The horse is of especial interest on account of the peculiarity of its limbs and from the fact that its history or line of descent is known from fossil forms. It is a test case as to the evolutionary theory. (See Evolution.) This animal walks upon the extreme tip of the third toe on both fore and hind feet. The splint bones are rudimentary traces of former toes. They have become so reduced that they correspond only to the second and fourth bones of the palm of the hand and the instep of the foot. (See Foot.)

Horses were tamed many centuries ago, and probably were first domesticated in Asia. The earliest records concerning the horse are on Egyptian monuments dating 1900 B. C. The only truly wild horses are now found in Asia and Africa. Those of South America and of the plains of North America are believed to be descended from horses imported by the Spanish invaders and allowed to run wild. There are many varieties of horses, produced by breeding and crossing of different stocks. It is somewhat uncertain from what original stock the various kinds of horses have been derived. There are three main types: the more slender and rapid travelers, the heavy draft-horses and the tough, shaggy varieties. The first doubtless came from the Arabian stock; the heavy-bodied draft-horses are derived from varieties imported from Flanders, Normandy and Germany and are believed to be derived from the great black horse that inhabited nearly all Europe in ancient times. In the process of breeding the descendants of these large horses were mixed with the more slender varieties from Spain and the Orient, and this gave rise to intermediate forms. The tough, shaggy kinds very likely came from mountain varieties which originally lived in Asia Minor and the foothills of the Himalayas. The race horses have been carefully bred for speed, and furnish a good illustration of what can be accomplished by selection and attention to surrounding conditions. Records of speed began to be kept systematically in 1818; at that time the highest speed of a trotter was about one mile in three minutes; in 1859 this had been reduced to 2:19¾. In 1903 the trotting record was lowered to 1:58½. A mile was paced in 1:55 in 1906. See Flower's *The Horse*.

Horse Chest'nut, one of the Buckeyes, a most cosmopolitan tree, found in the Old World and the New wherever climatic conditions allow it to exist. It makes a dense shade, is one of the most popular shade-trees of Europe, grows vigorously in this country, is common in public and private parks, and is planted along roadsides. Winter buds of large size and a polished brown tip the twigs, and no fairer sight is given the tree-lover than the "unfolding of the leaf bundle, the lifting of the pale green, silvery tent." The blossoms are very fragrant, telling of the tree a long way off. The fruit, a large nut, mahogany colored with a scar of white, is very bitter; while not edible, it at one time was considered to have virtue, and was carried in the pocket to prevent rheumatism.


HORSE CHESTNUT

Hor'ticul'ture, the art of growing fruits, vegetables, flowers and plants for domestic use and for decoration. It applies the known principles of chemistry, physics, plant-physiology etc., and includes vegetables and fruit-growing and floral and landscape-gardening.

Fruitgrowing has developed remarkably within the last 60 years in the United States. Previous to that time it hardly was a separate industry in any large section of the country, but gradually the parts of the country suited to particular kinds of fruit-growing have been located; for example: the peachproducing areas of Delaware, Maryland, New Jersey, Michigan and Georgia, the grape section of New York and Ohio and the semitropical fruit-regions of Florida and southern California. In consequence the various phases of fruitgrowing as a business have become differentiated. Tillage, pruning, spraying, packing, harvesting, transporting etc. have all come to demand special attention. The state experimental stations of the agricultural colleges have been of great service in promoting the development of this industry, especially where they have been able to investigate the different problems of the various localities.

Vegetablegrowing has undergone a somewhat similar development. The growth of large cities created a demand for a great variety of vegetables. With increased transportation facilities it became practicable to send the early vegetables from the south to the towns and cities of the north, and this business has in the last 30 years assumed large proportions. Some important regions for the production of early vegetables are Virginia, North and South Carolina, Florida, Texas and California. The growing of early vegetables under glass is also a business of considerable importance in the vicinity of cities. Horticulture gradually merges into several of the various phases of agriculture.

Floriculture is the third main branch of horticulture. This includes landscape-gardening, which is the art of so growing and disposing of flowers and plants as to create a beautiful landscape effect. Examples of the product of the art are to be seen in our well-kept city parks and in the private grounds of some persons of means throughout the country. Landscape-gardening is really one of the fine arts.

Along with horticulture have developed various allied industries, as that of the nursery, of seed production, preparation of fertilizers, manufacture of baskets and barrels, canning factories etc.

Hose'a or **Osee'**, a Hebrew prophet who lived probably during and after the time of

Jeroboam II, about the middle of the 8th century B. C. He is mentioned nowhere in the Old Testament except in the book which bears his name, the chief interest centering about him being in the first three chapters regarding his marriage and prophcies. He is mentioned several times in the New Testament under the name of Osee.

Hosmer (*hŏz′mĕr*), **Harriet,** an American sculptor, was born at Watertown, Mass., Oct. 6, 1830. A delicate child, she was compelled to live mostly in the outer air. She began modeling at home after a few lessons at Boston and St. Louis. Her first work was a reduced copy of Canova's *Napoleon,* followed by *Hesper* in 1852. In that year she went to Rome and there entered the studio of John Gibson. Here she copied from the antique. Her first full-size figure, *Œnone*, was completed in 1855. The work which brought her into renown was an original statue of *Puck* and a companion figure called *Will-o'-the Wisp*. Among her other statues are *Zenobia*, *The Sleeping Faun* and a companion piece, *The Waking Faun.* She made the statue of Thomas H. Benton for the Missouri legislature. She resides at Rome.

Hos′pitals, places for the care of the sick or wounded, were first known as *hospitia,* and were used to relieve lepers, when leprosy was a scourge in Europe. The modern hospital is usually divided into wards or wings, extending from the main body, each ward being in charge of a separate force of attendants and often devoted to the treatment of a particular disease. Hospitals, as a rule, are maintained by the state, county or city, but there are many now endowed and maintained by private individuals. Some of the oldest and most famous hospitals are St. Thomas (London, 1553), St. Bartholomew (London, 1546) and Bethlehem (London, 1547). The Hotel de Dieu, Paris, founded in the 17th century, is probably the oldest and most famous in France. See *Notes on Hospitals* by Florence Nightingale.

Hot′bed and **Cold-Frame** are terms often used interchangeably; but the former refers rather to a seedbed made by surfacing a deep layer of fermenting compost or horse-manure with a few inches of finely-worked loam; while cold-frame refers to the rectangular, wooden frame having a cloth or glass cover, which protects from frosts the young plants growing in the hotbed beneath. So we may speak of starting plants in a hotbed or under glass. The whole is a substitute for a hothouse in early spring. The fermentation which heats the soil (whence the name) should be spent before planting. The cold-frame prevents too rapid radiation of the internal heat. The glass-sash slopes to the south and is loose or hinged, to allow ventilation when weather permits. The use of this arrangement makes sprouting and forcing possible when the soil outside is too cold for planting. Hotbeds are not started before the latter part of February, except in the southern states. The hotbed often serves as an intermediate stage for tender plants between the indoor windowbox and outdoor conditions. Cold-frames are often used apart from hotbeds to force hardy perennials, as violets, to early blooming. They use no heat except such sun-light as they store up; hence their name.

Hotel′ (French *hôtel*), an enlargement of what formerly was called an inn. Since the era of railroads, hotels have been built to marvelous sizes. The main difference between European and American hotels is that in the former there is a price upon every dish ordered in the dining-room, while the latter makes a fixed rate for meals and room.

Hot Springs, a city and the county-seat of Garland County, Ark., is 55 miles southwest of Little Rock; on the Rock Island and Little Rock and Hot Springs Western railroads; 600 feet above tidewater; near the eastern side of the Ozark Mountains. It is widely noted for the hot waters that flow from 44 springs included in a space of 10 acres on the western side of Hot Springs Mountain. The waters of these springs, ranging in temperature from 76° to 157° Fahr., the daily flow of which is 1,000,000 gallons, are owned and controlled by the United States government under the direct care of the Secretary of the Interior, and are beneficial in a multitude of diseases. Notable cold springs, famous for their curative properties, are Potash-Sulphur and Mountain Valley.

In 1832 four sections of land, the thermal springs being in the center of the district, were set off by Congress as a government reservation. Since then the government has established the Army and Navy Hospital on the Hot Springs Mountain, and expended large sums of money in improving and developing the reservation. The government bathhouses, extending along Central Avenue, are tasteful in design and have attractive surroundings. There are many hotels, the Eastman, Arlington, Park and Majestic ranking among the largest in the country; and as a health and pleasure resort Hot Springs is deservedly popular, having annually more than 100,000 visitors.

The famous novaculite whetstone quarries are in the northern part of the city.

Hot Springs was settled about 1804, incorporated as a town in 1876, and chartered as a city of the first class in 1879. Public buildings, recently completed, are a fine courthouse that cost $150,000, city hall and operahouse, costing $100,000. A similar amount is being expended on schoolhouses and churches. Population 14,564.

Hot'spur, Harry. See Percy.

Hottentots (*hŏt't'n-tŏts*), a people who were in possession of Cape Colony, Africa, before the settlement by the whites. The name was given by the Dutch to the real Hottentot and to the Bushman, though they are distinct families. In number there are about 17,000 Hottentots proper and 100,000 half-breeds. They are of medium stature, have light-brown skin, hair growing in woolly knobs, high cheek bones and small hands and feet. Their language consisted of three dialects, but since the advent of white men (1652) they have adopted the languages, dress, manners and vices of the Europeans. See *History of South Africa* by Theal and *Expedition of Discovery into the Interior of Africa* by Alexander.

Hour'glass, a device of two glass bulbs connected by a very narrow and short neck, having in one bulb a sufficient amount of colored sand, which, in running from one bulb to the other, marks an hour. It was in use by the ancients even long before the sundial, and in the 16th and 17th centuries often stood on the pulpits of churches to measure the length of the sermon, where its falling sands were watched by anxious eyes. The three-minute glass, on the same principle, is often seen nowadays.

Housatonic (*hōō-sa-tŏn'ĭk*) **River,** about 150 miles in length, rises in Massachusetts, and, flowing through Connecticut, discharges into Long Island Sound. It affords water-power to many manufacturing villages. The scenery along its course is very beautiful.

House-Pets may vary extremely in purely utilitarian value, but all have certain values in bringing out in children qualities of kindness, sympathy and appreciation of responsibility; and the value of pets may vary in the degree to which they serve this latter end. While pets, as pets, may range from toads to horses, household pets include a rather definite circle of animal life: those which more strictly share the domicile of human creatures, as dogs and cats, and those kept in near proximity, as rabbits, guineapigs etc.

House-pets, strictly, may be narrowed to include only canaries, parrots, cats and the smaller breeds of dogs. Large dogs, rabbits, guineapigs, squirrels, poultry and pigeons belong to the household but not in the house. As to use, dogs might be classed as watchdogs, companions for children, sheepdogs and hunting-dogs, the qualities of the last two not being necessarily related to any desirability as house-pets. The most effective watchdogs are those kept inside at night, away from certain persuasions of evildoers; such dogs are fox, bull, airedale and other terriers, the spitz and poodle, all being active, alert and intelligent. Valuable outside watchdogs are the Great Dane, bred to this for generations, the English mastiff and the Newfoundland. As companions and protectors of children the favorites are the St. Bernard, the English mastiff and the Newfoundland, though certain families of the latter may show uncertain tempers. The *dachshund* has special ability in protecting poultry from skunks, weasels etc. Aside from his herding abilities, the Scotch collie is a great favorite of young children. Certain of the terriers, small spaniels and pugs seem to be of little use except as ornaments and pets. The cocker, one of the spaniels, is in many respects almost as good a general purpose dog as the collie or Newfoundland. Dogs should not be overfed, or be given sweet or greasy food; but the diet should be a mixed one. Too much meat makes them smell "doggy." Small bones are apt to be splintered in chewing, and so choke the dog. Prof. Hodge has aptly said: "A gnawing-bone is the dog's tooth-brush and should be kept well-supplied at all times, both for business and amusement." A dog is the best kind of a flea-trap. A castile or ivory soap lather will kill the fleas, and should be given for the dog's sake once a week in summer and once a month in winter. But one person should have the care and training of a dog. "A whip ruins more dogs than it cures." Yelling at a dog and chasing him make him nervous. Give praise when deserved. Tricks should be taught alone in a quiet place, always repeating the command in the same words, with rewards of food for the effort made by the dog. (See Dog).

"The cat is the only animal that has been tolerated, esteemed and, at times, worshipped, without a distinctly valuable quality" (Prof. Shaler). Cats have the advantage of being cleaner and less boisterous than dogs. Cats need access to fresh water and to grass or catnip, which is their medicine. The system of a cat that has been catching mice does better when supplied with milk. Abundant feeding prevents the killing of birds and chickens — and also of mice. A cat kills, on an average, 50 song-birds a year, and a single cat has been known to destroy six nests in a day. (Forbush.) The cat returns readily to the wild state, whereas the wild dog eems to be an extinct species. White cats, while more docile than black ones, have weaker constitutions. Of the Maltese or "blue" cats, the blue-eyed ones are favorites and hardy. The long-haired varieties are better pets than short-haired ones, but are not so good mousers and possibly are less hardy. The artificial conditions of their life are very conducive to tuberculosis, as shown by the large percentage having nodules on the intestines and lungs. Cats and dogs that run loose and have access to garbage are possibly dangerous carriers of disease; children should not be permitted to fondle either about the face. (See Cat.)

Canaries are naturally hardy, and disease is the result of neglect. The cage and perches should be kept very clean. Drafts, extremes of temperature and the steam of the kitchen are to be avoided. The best seed is equal amounts of canary-seed, rape-seed and millet. Supply sand, cuttle-fish and greens, but avoid sweets. Loss of voice is due to overfeeding, a cold or too much singing. Persian powder in the cage and among the feathers destroys lice. (See CANARY.)

Rabbits and guineapigs are popular as yardpets, though the former are often bred for eating, as the Belgian and Flemish varieties. The lop-eared varieties occur in various colors and require mild winters. The Himalayan is a smaller breed than the last, is hardy, and has a beautifully marked "mock ermine" fur. The Angoras, in white and other colors, are popular, but hard to keep clean on account of their long fur. The Dutch rabbits are smaller than most, are hardy and prolific; they are colored with a white collar. Rabbits breed several times a year, with from five to twelve in a litter. Clean straw should be provided for the nests. Provide clean water every day. Feed on hay and oats, with turnips, carrots and apples. Feed grasses and leaves only after partly drying them out. Salt should be provided at all times. The pens should be shaded, be dry, have good ventilation, be protected from rats by wire netting, and furnish room for exercise. Does with young must be kept apart. The young are liable to internal injury if picked up by their bodies. Rabbits should be handled by their ears or by the nape of the neck. (See RABBIT.)

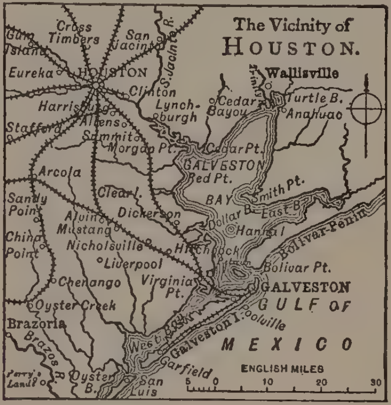
Guineapigs or cavies of the common sort are black, chocolate brown, reddish, gray, yellow, white and spotted. The Abyssinian and Peruvian varieties are both long-haired, the former albino and the latter in colors. The animals have nothing to recommend them as pets except their cleanliness and general hardiness. Their general treatment is the same as that of rabbits.

Pigeons are attractive because of their variety of color and form and for the possession of many human-like traits, some altruistic, others not. The best quarters, unless a special house be provided, are those rigged up in a loft, rather than boxes nailed outside of a barn, as they furnish more protection. If the birds are confined, an outside cage should be annexed. Pigeons breed in pairs, and must have a separate home for each family. They should be given plenty of clean water to bathe in, gravel, coal ashes etc. to peck at, grain and grass seeds to eat. They are fond of hempseed, which may be used to tame them. The nests should have absorbents, as sawdust or fine shavings of seasoned lumber,—never from resinous pine. Under good management five squabs a year can be raised by each pair. (See PIGEON.)

Many wild animals, as raccoons, rats, squirrels etc., can be kept as pets, and seem to be reconciled to their lot if captured young enough. The main requirements for health are cleanliness, exercise and food as nearly like their natural diet as possible. See Biggle's *Pet Book* and Hodge's *Nature Study and Life*.

House-Plants must contend with too dry air, too high temperature and lack of light and fresh air. They may be classed as those grown principally for their foliage and as those principally grown for their blossoms. The best plants of the first kind are those with leaves of leathery nature, or adapted to retain their moisture by other means. Such plants are the English ivy, the various cacti, century-plant, rubber-plant, fan and sago-palm and screw-pine. The flowering plants are best brought into the room when about to bloom and removed when through; of these are the "calla," chrysanthemum, cyclamen, freezia, heliotrope and primrose. The begonia, fuchsia, "geranium" and oxalis, though helped by similar treatment, are apt to be deprived of such benefits. Because of the moist air, the kitchen is an excellent place in which to grow these plants and to bring plants from the other rooms to recuperate, if it is impossible to provide a special room that can be kept moist. Zinc trays with moss, pebbles and water, to set the pots in, help to keep the air moist. Nonporous pots or vessels dry out less quickly than porous crockery. All should have holes in the bottom, and should stand in or above trays or saucers to secure good drainage. Thus the plants may be plentifully watered without depriving the roots of needed air. Broken stones or bits of crockery in the bottom facilitate drainage and soil-ventilation. Small pots need watering oftener than large ones. Most plants do best in a soil of equal parts of rotted sod, old leaf-mould, well-decayed cow manure and clean sand. Pots should not be too full. Plants should be potted before growth begins or after it stops. After growing all summer they need a rest, with little water, in a cool place. Insect and fungous pests are usually troublesome on account of lack of water and fresh air. Plants should be washed off with warm water; scale insects should be scraped off with a stiff brush. Night temperature need not be over 50 degrees, and may fall even ten degrees lower. Special directions for the growth and care of some of the more popular house-plants are here given. Begonias will grow better in north windows than will many other plants, but need considerable sun in the winter. They require earth composed of three parts loam and one part rotted manure. The fibrous-rooted varieties are more easily grown than the more tuberous plants. Cacti require soil, half fibrous loam and half coarse, mortar rubbish. They should be put in large pots one third full of rough coke or broken crockery to secure perfect drainage, and should seldom be repotted. They require all the sunlight available. Fuchsias are among the easiest plants to manage in the average living-room, and will do well in a north room that is kept warm, as this reproduces somewhat the shady condition of their original subtropical home. They thrive in ordinary garden-soil, but need frequent applications of liquid manure; and bloom best if the roots are somewhat cramped. They are grown from seeds or slips with two or three leaves. Pelargoniums or "geraniums," as they are commonly known, grow best in a pliable clay loam without manure The few diseases troubling these plants are apt to be due to manure or too much water. Slips should be started in 2-and-½ inch pots, and be gradually repotted in larger sizes. The soil should be pressed in firmly to make a firm growth. They may be fed manure-water when they reach the five or six-inch pots. The rubber plant is the most popular of all foliage plants, over 75,000 being sold every year. It is tough, thrifty and can stand poor light. Bushy plants may be obtained by topping, or through natural branching, coaxed by two or three months' rest in the spring. They are injured by dust and should be frequently sponged. Bulbs intended for forcing should be set in pots, which should be buried outdoors in the ground for several weeks or set in a cool, dark basement, and should not be brought into the light until well-sprouted. Hyacinths require equal parts of loam and rotted manure, with some coarse sand. The bulbs should be left one third above the soil, three or four in a five-inch pot They should be planted from September to late November, to secure a long succession of blooms. Narcissus bulbs may be treated in much the same way or planted in quantities in shallow wooden boxes. Tulips require earth of two parts loam to one part of light manure, with sand added. Three to five bulbs may be planted in a pot, but deeper than hyacinths. Easter lilies (Bermuda lilies) require rich earth without manure. Leaf-mould should furnish the enrichment; or if manure, it should be at the bottom of the large pot away from contact with the bulb. Bulbs of the sacred Chinese lily grown in water should be kept submerged in a bowl partly filled with stones. The water should be changed every two or three days, and not be allowed to get cold. Certain varieties of hyacinths and tulips may also be grown in glasses above water. See Bailey's *Cyclopedia of American Horticulture.*

Houston (*hūs'tŭn*), Texas, county-seat of Harris County, 50 miles north of Galveston on Buffalo Bayou. It is named after Sam Houston, and is one of the largest railway and business centers of that state. It is an inland city with all the advantages of a seaport. The shipchannel, at present undergoing government improvement, gives direct communication with the sea; and, besides, the city has the service of fifteen railroads. It is a distributing center for cotton, rice and oil, while corn, hay and sugarcane are important products of the nearby section. Houston has four large rice mills, a rice elevator and, close to the city, a sugar mill. The city has 38 public-school buildings and 228 teachers, besides St. Thomas' College for young men and boys, St. Agnes' Academy for girls, Rice Polytechnic Institute for the advancement of literature, art and science, four schools of music, five commercial schools, a nurse's training school, a dental college etc. Houston has two libraries, many churches and all the conveniences of a modern and progressive city. Population, according to the census of 1910, 78,800.



Houston, Sam, president of Texas when it was a republic, was born in Virginia on March 2, 1793, and was adopted and reared by a Cherokee Indian in Tennessee. He enlisted in the army in 1813, and by his bravery rose to the rank of second-lieutenant. After leaving the army he studied law, and in 1823 and 1825 was a member of Congress and in 1827 governor of Tennessee. After three months of married life, he, in 1829, abandoned his home to go to the Cherokees beyond the Mississippi. He remained here three years, and at the outbreak of war between Mexico and Texas was made commander-in-chief. On April 21, 1836, he defeated the Mexican force under Santa Anna at San Jacinto and won the independence of Texas. He was elected its first president and was re-elected in 1841. When Texas came into the Union, in 1845, he was sent to the United States senate and in 1859 became governor of the state. He opposed secession, and was deposed in March, 1861. He died on July 25, 1863.

How′ard John, a philanthropist and prison-reformer, was born in Middlesex, England, about Sept. 2, 1726, and received his education by private tutors. He inherited a fortune from his father, and in 1756 sailed for Lisbon, but was taken prisoner by the French and thrown into prison, where his own experience first gave him his ideas of prison-reform. His life was devoted to prison-reform. To this end he visited all penal institutions. While in Russia he contracted typhus fever and died on Jan. 20, 1790. He published two works on the state of prisons and hospitals. He is honored as one of the most self-denying and benevolent of men. See *Lives* by Dixon, Field and Stoughton.

Howard, Oliver Otis, an American general, was born in Maine, Nov. 8, 1830, and graduated from West Point in 1854. He commanded a regiment in 1861, and was made brigadier-general for gallantry at the battle of Bull Run. He lost an arm at the battle of Fair Oaks, but afterwards commanded the army of the Tennessee. He was commissioner of the Freedmen's bureau from 1865 to 1872. In 1869 he was made president of Howard University, Washington, an institution for the education of the colored people. In 1877 he led an expedition against the Nez Percé Indians, compelling the surrender of Chief Joseph, and later against the Piutes. He was made major-general in 1886, succeeding General Hancock in the command of the division of the Atlantic, where he remained until his retirement in 1894. In 1895 he founded Lincoln Memorial University at Cumberland Gap, Tennessee. His *Autobiography* was published in 1907. He died Oct. 26, 1909.

GEN. O. O. HOWARD

Howe, Elias, inventor of the sewing machine, was the son of a farmer, and was born at Spencer, Mass., July 9, 1819. He worked for a manufacturer at Cambridge, and there conceived the idea of the sewing machine. After five years' labor he completed and patented it, but was penniless and could find no sale for his invention. He sought England unsuccessfully, and on his return found his machine imitated. After a long lawsuit he recovered his rights, organized a company to manufacture his machines, and made a large fortune. He served in the 7th Connecticut regiment during the war. He died at Brooklyn, N. Y., Oct. 3, 1867.

Howe, Julia Ward, the wife of Dr. S. G. Howe, was born at New York, May 27, 1819. She was carefully educated, and early wrote plays and poems. While on a visit to Washington during the Civil War she wrote the popular *Battle Hymn of the Republic.* She was a powerful advocate of woman's suffrage and a founder of the New England Woman's Club, of which she has been president. She published many poems and essays. She died Oct. 17, 1910.

JULIA WARD HOWE

How′ells, William Dean, an eminent American author, known in the Old World as well as the New as novelist, poet, critic, dramatist and essayist, was born at Martin's Ferry, O., March 1, 1837. The son of a printer and journalist, he early became familiar with journalistic and literary work and decided to follow it as a career. His first contributions were to the *Cincinnati Gazette* and *Ohio State Journal.* From 1861 to 1865 he was consul at Venice, where he wrote his papers on *Venetian Life.* After his return he wrote for the New York *Tribune*, the *Times*, the *Nation*, the *Atlantic* and, later, for the *Century*, *Harper's Magazine* and the *Cosmopolitan.* He was editor of the *Atlantic* during 1871-81, and afterwards held a position on *Harper's Magazine.* His real success, however, was as a writer of fiction, among his most popular novels being *Their Wedding Journey*, *The Lady of the Aroostook* and *The Rise of Silas Lapham.* His farces, *The Sleeping Car*, *The Drawing Room Car*, *The Elevator* and *The Mousetrap*, are the best specimens of his humor. In 1904 he received from Oxford University the degree of Hon D.C.L. Mr. Howells has also published valuable literary studies, as *Literature and Life*, and suggestive

WILLIAM D. HOWELLS

studies of actual and ideal society, as *A Traveler from Altruria;* besides collections of poems.

How'itt, William and **Mary,** English writers of the first half of the 19th century. William was born in 1795 at Heanor, Derbyshire, England. On April 16, 1821, he married Mary Botham, born at Uttoxeter, England, March 12, 1799. The record of their lives is a record of the books they wrote. Some of their joint productions are *Literature and Romances of Northern Europe, Stories of English Life* and *Ruined Abbeys of Great Britain.* Mary Howitt was the first to translate the works of Hans Andersen into English. William wrote *History of Priestcraft, Rural Life in England, Student Life in Germany, Homes and Haunts of the British Poets* and *Poems.* They both died at Rome, William on March 3, 1879, and Mary on Jan. 30, 1888. See *Mary Howitt, an Autobiography*, edited by her daughter, Margaret.

Huber (*ü'bâr'*), **François,** a Swiss naturalist and author of a book on the habits of bees, was born at Geneva, Switzerland, July 2, 1750. He early lost his eyesight, but with the aid of his wife and servant he conducted many important observations on the habits of bees, and published his book in 1792, which was reprinted in 1796 and 1814 as *New Observations on Bees.* He died near his birthplace on Dec. 31, 1831.

Huck'leberry, the fruit of various species of *Vaccinium* and *Gaylussacia*, genera which belong to the heath family and are sometimes considered as forming a family by themselves, known as the huckleberry family. The former genus is restricted to America and contains about 40 species; the latter is widely distributed and contains about 125 species. The huckleberries of the market are as often called blueberries, and the various species have received numerous names, such as tangleberry, whortleberry, bilberry, deerberry, farkleberry etc. The common huckleberry of the markets is *Gaylussacia resinosa*, the black huckleberry. The species of *Vaccinium* are more frequently called blueberries.

HUCKLEBERRY

Hud'dersfield, a city in the West, Riding of Yorkshire, England. It owes its rapid growth to its situation in the coal district, its large water-power and its shipping facilities. It is the chief northern seat of the fancy trade, and has woolen mills, cotton and silk spinning, iron founding and machine-making. Population 94,851.

Hud'son Bay, a gulf or rather inland sea in the northeast portion of North America, is wholly landlocked, except on the north, where Southampton Island and Fox Channel lie between it and the Arctic Ocean and where Hudson Strait, running 500 miles southeast, joins it to the Atlantic. Including James Bay on the southeast, it is 1,000 miles long and, on an average, 600 miles wide, and covers an area of about 500,000 square miles. This sea is the great drainage reservoir of the Canadian northwest territories. Of the many rivers flowing into it the two largest are the Churchill, whose deep and narrow mouth forms the best harbor on the shores of the bay, and the Nelson, which is navigable for 70 or 80 miles. The possibility of opening a short route for transportation of the products of the great grain fields of the northwest through Hudson Bay to Liverpool has engaged the attention of the Canadian government, and as a result of surveys and studies of climatic conditions it is thought that this may be found practicable.

Hud'son Bay Company, a corporation formed in 1670 by Prince Rupert and 17 other noblemen for the purpose of importing furs and skins into Great Britain. The company was given the ownership of the entire region draining into Hudson Bay. In 1869, shortly after Canadian federation, the Company ceded all its rights to Britain, receiving $1,500,000 indemnity from the Dominion of Canada and reserving all its forts, 50,000 acres and one twentieth of all lands between Red River and the Rocky Mountains. See Bryce's *Remarkable History of the Hudson Bay Company.*

Hudson, Henry, English navigator, is first heard of in 1607, when he embarked in a small vessel in search of a northeast passage. In his second attempt, in 1608, he reached Nova Zembla, and in his third, giving up all hope of finding a northeast passage, he sailed south, discovered the river now bearing his name, and sailed up it for 150 miles. He set off upon his last voyage in 1610, discovered the strait now called Hudson Strait, and passed through it into Hudson Bay, where, although poorly provisioned, he determined to pass the winter. When food gave out, the sailors mutinied, and cast Hudson and eight others adrift in the summer of 1611. The ringleaders perished in a fight with savages, and the survivors after great suffering reached England. All these voyages were made in the service of Dutch merchants. See George Asher's *Henry Hudson the Navigator*.

Hudson, N. Y., a city, port of entry, county-seat of Columbia County, on the Hudson River, about 30 miles from Albany. It is in an agricultural region, and has the following manufacturing establishments: Sash and blind factories and foundries and it makes machinery, car wheels, knit goods, and creamery products. The notable buildings are the State House of Refuge for Women, the State Volunteer Firemen's Home, the hospital, the orphanage etc. The city owns and operates the waterworks. Claverack Landing was settled in 1783, became Hudson in 1784, was incorporated in 1785, and was made a port of entry in 1790. It has the service of two railroads. Population 11,417.

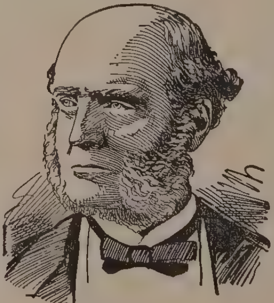
Hudson River, a river in New York state and one of the most beautiful in America. It rises in the Adirondack Mountains, 4,326 feet above sea level. At Glens Falls it drops 50 feet, then, taking a southerly direction, flows into the bay of New York. There is tidal influence for 151 miles from its mouth to Troy, and it is navigated by large steamboats to Albany. About 60 miles from New York city the river enters the highlands, the scene of Arnold's treason and André's death, towering abruptly from the water to a height of 1,600 feet. A few miles below are the United States Military Academy at West Point and the ruins of Fort Putnam. On leaving the highlands, the river widens to four and one half miles for 13 miles of its course, and is called Tappan Bay. Below, on the right, is a wall of rock, called the Palisades, from 300 to 500 feet in height, extending nearly 20 miles as far down as the upper part of New York city. From this point the river is called North River. The Hudson is 350 miles in length, and was named after Henry Hudson. Fulton's first steamboat was tried on its waters. A tunnel under the river between Jersey City and New York connects the latter with Greater New York. See the *Panorama of the Hudson*, published by the Bryant Literary Union of New York.

Hue′ (*hōō-ā′*), the capital of Anam, a French protectorate in Asia, is ten miles from the mouth of the Hue River. In 1801 it was strongly fortified by French officers. The heart of the city is occupied by the palace; much of the rest of it is filled with mud huts. There is little business. Population, with suburbs, 50,000.

CHARLES E. HUGHES

Hughes, Charles Evans, governor of New York, was born at Glens Falls, N. Y., April 11, 1862. He was educated in the public schools of Newark, N. J., and graduated from Brown University in 1881. During the next two years he taught mathematics at Delaware Academy, Delhi, and attended Columbia Law School, graduating in 1884 and being prize-fellow from 1884 to 1887. He was admitted to the New York bar in June, 1884, and practiced in New York from 1884 to 1891. He was professor of law at Cornell Law School from 1893 to 1895 and in New York Law School from 1893 to 1902. He achieved national distinction as chief counsel for the Armstrong committee in its life-insurance investigation (1903–4) In 1905 he declined the nomination of the Republicans for mayor of New York. He was elected governor of New York in 1906, and again in 1908. He was made an honorary LL. D. in 1907 by Columbia University. He was strongly supported as candidate for the presidency before the Republican convention in 1908.

Hughes, James Laughlin, Canadian educator, was born on Feb. 20th, 1846, near Bowmanville, Ontario. He received a public school education, and began teaching at 18. In 1871 he became principal of the provincial model school at Toronto, and in 1874 he was appointed inspector of schools for Toronto, a position which he still holds. In 1883 the Ontario government sent him as its representative to St. Louis to investigate the kindergarten system of that city, and owing largely to his influence the kindergarten movement was started in Ontario. He has done much to improve methods of teaching and reading and encourage educational progress and reform in general. He is the author of *Mistakes in Teaching*, *How to Secure Attention*, *Topical History of Canada* and other publications, chiefly educational.


THOMAS HUGHES

Hughes, Thomas, was born at Uffington, Berks, England, Oct. 20, 1823. He was educated at Rugby, entered Oxford in 1841, and was called to the bar in 1848, becoming a member of the chancery bar. In 1856 he published *Tom Brown's School Days*, a life-like and truthful picture of school days at Rugby. This is a book which will never die, and is perhaps the best boy's book that was ever written. The chief characters are drawn from life. The book throws great light on the character of that greatest of teachers, Dr. Arnold. In 1858 came out *The Scouring of the White Horse;* in 1861 *Tom Brown at Oxford;* and in 1869 *Alfred the Great.* He was all the time practicing law, and became queen's counsel in 1869 and county court judge in 1882. He early became associated with Maurice and Kingsley in the work of social and health reform among the London poor. He also represented Frome in Parliament from 1868 to 1874. He gained the good will of the working classes by his endeavor to promote a better understanding between employers and their men. In 1880 Hughes assisted in founding a coöperative colony in the United States, describing it in his *Rugby, Tennessee.* To him Chicago owes the founding of its public library in 1871. He died at Brighton, Sussex, March 22, 1896.

Hu'go, Victor Marie, was born at Besançon, France, in 1802, and was educated at Paris and Madrid. He produced a tragedy at fourteen; and nearly won the Academic prize at fifteen. At twenty he published his first *Odes and Ballads*, following it by *Hans d'Islande* the next year and then by his famous *Cromwell*, a tragedy almost impossible to act and difficult to read. In 1828 he published his *Orientales*, which is masterful in style and beautiful in wording. In 1830 appeared his great lyric *Hernani*, which gave rise to long arguments between the Romanticists, Hugo's party, and the Classicists; the year 1831 saw the birth of his famous novel, *Notre Dame de Paris* and the production of his plays, *Marion Delorme* and *Le Rois' Amuse* ("The King is Amused",) which was allowed to be produced for only one night. Then, in quick succession, came *Lucréce Borgia*, *Marie Tudor* and *Claude Gueux*. *Ruy Blas*, the next greatest drama after *Hernani*, was produced in 1838. Then followed a period of comparative inactivity until 1856, when his beautiful poems, *The Meditations*, appeared. These were followed in 1862 by the publication, in ten languages, of *Les Misérables*, by many considered the best of Hugo's fiction, and in 1865 by *The Man Who Laughs.* During his after-life he wrote poems, plays, novels and pamphlets, in many far outstripping all previous flights of imagination, portraying characters, extreme, sublime and ridiculous. He is acknowledged as the most wonderful manipulator of the language that ever graced the history of French literature. Hugo took a leading part in the French politics of his time, exiling himself while Napoleon III was emperor and, after his return in 1870, sitting in the constituent assembly, and in 1876 was made a senator. He was a greater novelist than a dramatist and a greater poet than a novelist. The range and capacity of his genius in rhythm and rime have not their equal in French literature. It is said of him: "He found French poetry a piece of brick and stucco, and left it a palace builded of jewels — a palace of the Arabian Nights." Hugo died at Paris, May 22, 1885.

Huguenots (*hū'gê-nŏts*), the name formerly applied to the adherents of the Reformation in France. In the time of Calvin (about 1525) many of the noble and middle classes joined the movement; but Francis I, being opposed to it, caused many to be burned as heretics. When Henry II of France joined the Protestants (1547-59), it gave the Reformation a great impetus; but it was stopped by the ascendency at court of the family of Guise. Under Francis II a chamber for the punishment of Protestants was established in each parliament, and executions, confiscations and banishments were common. The Protestants took up arms, appointing Louis I, prince of Bourbon-Condé, their leader, and on Feb. 1, 1560, at Nantes, petitioned the king for freedom of religion and the removal of the Guises. In the event of refusal, they were to seize the king and proclaim Condé governor-general. The king, being warned, fled to Amboise, where some bands of Protestants bearing arms afterward appeared, but were taken prisoners and 1,200 of them executed. When Charles IX, not yet of age, ascended the throne, his mother, Catherine de Medici, removed the Guises and was compelled to seek the support of the Protestants against them, and in July, 1561, there appeared an edict exempting the Huguenots from the penalty of death, and in 1562 another, giving noblemen the right of free exercise of religious worship on their own estates. The Guises then imprisoned the king and Catherine. The duke of Guise defeated the Protestants at Dreux and marched upon Condé at Orleans, but was assassinated in camp on Feb. 18, 1563. Then Catherine concluded the peace of Amboise, allowing free religion, except in certain districts; but, becoming allied with the Spaniards, she attempted the lives of Condé and Coligni and executed over 3,000 Huguenots. On March 13, 1569, Condé was killed at the battle of Jarnac.

Catherine, failing to suppress the Protestants by fair means, brought about the massacre of St. Bartholomew in 1572, wherein in two months over 30,000 were slain in Paris and the provinces. After the peace of Beaulieu Guise organized a Catholic association called the Holy League, at the head of which the king placed himself, and the sixth religious war began. Peace was again concluded in 1577, but on account of a violation of the terms of the treaty by the court, war was again commenced, only to be ended in 1580.

Until 1584 there was comparative quiet, but when Henry of Navarre became heir on the death of Anjou, Guise revived the League, and the "war of the three Henries" began. This was marked by the assassination of Guise and his brother, the Cardinal of Lorraine, and of the king himself. Then Henry of Navarre, ascending the throne, signed the famous Edict of Nantes, giving freedom of worship to the Protestants, April 13, 1598.

Until 1615 there was quiet, but then Condé again declared a revolution, ended by the treaty of Loudun the next year, only to be violated by the court in 1617; and after the surrender at Montpellier, Oct. 21, 1622, a partial confirmation of the Edict of Nantes was obtained. The court paid little attention to the treaty. So the duke of Rohan and Prince Soubise, at the head of the Protestants, attempted to regain their lost rights, but after defeating the royal navy several times were defeated by Cardinal Richelieu, who captured the Huguenot stronghold of Rochelle (1628). Louis XIV, abetted by Madame de Maintenon and the Jesuit father, Lachaise, then began a persecution, causing hundreds of thousands to flee to Switzerland, Holland, England and Germany. On Oct. 23, 1685, Louis revoked the Edict of Nantes. Then followed still more fearful persecutions. Many fled to the mountains of Cevennes, where they kept up a successful resistance until 1706, when the rebellion was suppressed with great cruelty. It was not until 1789-90 that they were restored to their civil and political rights by the national assembly under Louis XVI. From 1685 onward thousands of Huguenots entered England and supported William of Orange. See Baird's *Rise of the Huguenots* and *Huguenot Emigration to America.*

Huguenots, Les. Opera in five acts; words by Scribe and Deschamps, music by Meyerbeer. First produced in Paris in 1836. The drama deals with one of the most dramatic periods in French history — the 16th century. Its musical treatment by Meyerbeer was on a scale of magnificence and splendor previously unattempted. Its great length makes curtailment necessary on ordinary presentations, but it has continued to be the most popular of the productions of Meyerbeer's best period, notwithstanding the unfavorable criticisms of Schumann, Wagner and others. The German choral, *Ein feste Burg*, is introduced effectively in the first and last acts.

Hull, a city in Quebec opposite Ottawa, across Ottawa River, is a center of the lumbering trade, and has extensive sawmills, pulpmills and woodware and match factories. Population 14,000.

Hull or **Kingston-on-Hull,** an important English river-port, is in Yorkshire on the north bank of the Humber, where it is joined by the Hull. The docks and basins comprise an area of over 250 acres, the largest being the Alexandra, Albert and Victoria docks. It is the outlet for the manufactures of the interior, but also carries on an extensive manufacture of ropes, canvas, chain and machinery, and supports many mills. Among its old and notable buildings are Holy Trinity, St Mary's Lowgate (1333), Hull College, Hull Grammar School (1486), Trinity House and the town hall. Hull was made a free borough by Edward I in 1299. In 1642 the refusal of the governor to admit Charles marked the outbreak of the Civil War, and caused it to be twice besieged by the Royalists. Hull is the third largest port in Britain and has a population of 278,024. See Freeman's *English Towns.*

Hull, Isaac, naval officer and nephew of William Hull, was born at Derby, Conn., March 9, 1773. At 14 he became a cabin-boy, then commanded a ship in the West Indian trade, and in 1798 entered the American navy as fourth-lieutenant. He was assigned to the frigate *Constitution*, and commanded it as captain after 1806. He was an able seaman, and in July, 1812, escaped from the English squadron, afterwards, on August 19, capturing the British ship *Guerriere* of 44 guns, injuring her so that she had to be burned. After this, Hull's frigate was called *Old Ironsides.* Hull afterwards commanded squadrons in the Pacific and in the Mediterranean, retired in 1841, and died at Philadelphia on Feb. 13, 1843. See his *Life* by Gen. James Grant Wilson.

Hull, William, American general, was born at Derby, Conn., in 1753; fought in the Revolutionary War; and was governor of Michigan Territory during 1805-12. He was hurriedly sent at the head of a poorly-conditioned army of 1,500 men to defend Detroit from the British in 1812. He was compelled to surrender, and, to shield the government, he was tried by court-martial and sentenced to be shot. But the sentence was never carried out, and he died on his farm, in Massachusetts, Nov. 29, 1825.

Hum'bert I, second king of Italy, was born on March 14, 1844. He commanded a division in the war with Austria in 1866, taking part in the battle of Custozza. He married his cousin, Princess Marguerite of Savoy, in 1868, and succeeded his father, Victor Emmanual II, as king of Italy in 1878. An attempt was made to assassinate him in the first year of his reign. His changing the death-sentence of the would-be assassin to imprisonment at hard labor and his frequently exposing himself to cholera while relieving the suffering of the sick and dying, when this scourge was raging at Naples, made him most popular with his subjects. At Monza, near Milan, on

July 29, 1900, King Humbert was assasinated by an Italian anarchist. He was succeeded by his son, Victor Emmanuel III.

Humboldt (*hŭm'bōlt*), **Friedrich Heinrich Alexander, Baron von,** one of the greatest of naturalists, was born at Berlin on Sept. 14, 1769. He studied at the universities of Frankfort, Berlin and Göttingen. He next entered the Mining Academy at Freiberg, and afterward held an office in the mining department. He had already made scientific tours along the Rhine, in England, France, Belgium and Holland, and now the desire to see tropical countries led to his giving up his office. But before he started, three months at Jena gave him the friendship of Goethe and Schiller and a short stay at Paris that of Bonpland, who became his fellow-traveler. He set sail in June, 1799, and spent five years in exploring what now are Venezuela, Colombia, Ecuador, Peru and Mexico, which he crossed from east to west. Twenty years were spent in preparing the notes taken on his American journey for his great book, *Journey to the Equinoctial Regions of the New Continent.* In 1829 Humboldt again became a traveler, accompanying an expedition sent by Emperor Nicholas to the north of Asia to explore the Ural and Altai Mountains, Chinese Szungaria and the Caspian Sea. The entire journey lasted nine months, and extended to 2,320 miles. It is described in Humboldt's *Central Asia.* In 1830 he was sent to Paris to carry the king of Prussia's recognition of Louis Phillippe, and for the next 12 years was employed on similar political missions. In 1835 was brought out his *Examination of the Geography of the New Continent.* His last great work, *Cosmos*, is one of the greatest scientific works ever published. Humboldt's gifts to science are large and varied — on the geography of Spanish America, meteorology, magnetism, climate, electricity, the breathing of fishes and crocodiles etc. See Lord Houghton's *Monograph.* He died at Berlin May 6, 1859.

Humboldt, Karl Wilhelm von, the older brother of Alexander, was born at Potsdam, Prussia, in June, 1767. He was educated at Frankfort, Berlin and Göttingen. He entered the government service, becoming counselor of legation. For awhile he lived at Jena, where he became a close friend of Schiller, his correspondence with whom is well-known. In 1801 he became Prussian minister at Rome. From Rome he returned to Berlin to fill the high place of first minister of public instruction, and it was owing to him that Berlin University, now the first in Germany, was founded. In 1810 he became ambassador to Austria. His *Æsthetic Essays* were published in 1709. He, however, is most famous for his studies in language. He was the first scientifically to study the Basque tongue, spent much labor on the languages of the east and on eastern literature, and carefully studied the languages of the South Sea islands. His essay *On the Variety of Structure in Human Speech* marks a new era in the study of language. *Letters to a Female Friend* show him to have been a most pure and amiable man. He died near Berlin, April 8, 1835.

Humboldt River, Nevada, is the longest river in that state, having a course of 350 miles. It flows into a lake having no outlet, Humboldt Lake. Along this stream runs the course of the Central Pacific Railroad. This stream is but small, and is saline and alkaline in its qualities; while its banks are in general clad only with sagebrush, though willows and other vegetation occasionally appear. The course of the river indicates the most practicable pass through the Nevada ranges; but even Lake Humboldt is nearly 4,000 feet above the level of the sea.

Hume, David, philosopher and historian, was born at Edinburgh, April 26, 1711. His father was a Scottish laird, but David was a younger son and had to make his own fortune. He was educated at Edinburgh and, as his father wished him to study law, he did so, but gave it up to try business life at Bristol, which he found just as little to his taste. He now became a student, with no settled plan of work. In 1739 appeared the first two books of his *Treatise of Human Nature*, better known by its later title, *An Inquiry Concerning the Human Understanding*, the germ of his philosophy. This book marks a new era in philosophy, yet it was little noticed at the time. In 1751 he brought out his *Inquiry into the Principles of Morals*, a work of great force. His *Political Discourses*, written in the following year, laid the foundation of free trade, though the doctrine was more fully worked out by Adam Smith. His appointment as keeper of the Advocate's Library in Edinburgh, with a small salary, surrounded him with books and put it into his head to write a history of England. The first volume, covering the reigns of James I and Charles I, came out in 1754. He carried it on to the Revolution (1688), and then wrote backward through the Tudors to the Roman conquest. Hume's *History of England* is not a fair and careful record of facts; but for many years it was the standard work, and still is one of the most interesting to read. In 1763 Hume went to Paris as ambassador's secretary. His last and highest office was under-secretary of state for the home department. Hume died at Edinburgh, Aug. 25, 1776. See Huxley's *Hume* in the English Men of Letters Series and Leslie Stephens' *English Thought in the Eighteenth Century.*

Humming Birds, small birds with narrow, pointed wings, often seen hovering over flowers. In this position their wings vibrate so fast that they make a humming sound. These birds are confined solely to the New World. Although there are about 500 species, there is only one found in the United States east of the Mississippi. Nevertheless, this single species — the ruby-throated humming bird — is widely known to residents of the United States. Other kinds live west of the Mississippi, and in all North America there are about 15 species. The greatest variety live in Central and South America and in the West Indies. The humming birds are related to the swifts. Besides their long wings, already mentioned, they have long slender bills of different forms — straight in some cases, in others curved and splendidly adapted to the form of the flowers which they visit. It was formerly supposed that they fed only upon the nectar of flowers, but they also eat insects. Some of them are captured while on the wing, and others are obtained from the flowers which they frequent. They have weak feet and are much on the wing. Some of them are somber in color, but the majority have a brilliant plumage which shows a metallic reflection, changing according to the angle at which it is seen. Their nests are small, beautifully made structures. Often they are covered with lichens and resemble a knot on the limb. The young are fed through the bill, food being injected through it, as through a syringe, into the mouth of the young bird. The ruby-throated humming bird is migratory, and arrives from the south about the first of May. It frequents flowers with a spreading corolla, like the trumpet flower and the morning glory. It is not timid, and can be tamed to eat sweets from the hand. Its only note is a squeak, but some of the tropical species are good singers. The sun-birds of Africa, India, the neighboring islands and northern Australia are often confused in the popular mind with humming birds. They are small birds of brilliant plumage, often with a metallic luster, but belong to quite a different family.

HUMMING BIRD.

(a) Sword-bill Humming Bird. (b) White-booted Racket-tail. (c) (ć) Male and Female Tufted Coquette.

Hum'phreys, Andrew Atkinson, an American soldier, was born at Philadelphia, Nov. 2, 1810, graduated at West Point in 1831, and was made first lieutenant in the topographical engineers. He had charge of the Coast Survey from 1845 to 1849 and, later, of the topographic and hydrographic survey of the Mississippi delta. He served through the Civil War, advancing to the rank of major-general of volunteers, taking part in the battles of Fredericksburg, Chancellorsville and Gettysburg, the siege and overthrow of Petersburg and the pursuit and surrender of Lee's army. In 1866 he was made chief of engineers, with the rank of brigadier-general. He was retired in 1879, and died at Washington, D. C., Dec. 27, 1883.

Hu'mus, the fine soil resulting from the decay of organic material. Its value lies less in the mineral matters it returns to the earth than in the change it produces in the texture of the soil. Its addition to stiff soils mellows them and gives them a better water capacity. See, also, SOILS and MANURES.

Hun'dred Years' War. The name given to the long series of contests between England and France for the possession of the French crown and French territory, lasting from 1337 more or less intermittently till 1453. For history of this period see ENGLAND and FRANCE. See, also, Green's *Short History of the English People.*

Huns, a wandering race of early times, whose earliest ancestors probably were the Hiung-nu, a people of Turkish stock, who formed a powerful state in Mongolia in the second century B. C. The tribesmen afterward scattered, and one part settled in the neighborhood of the Rivers Ural and Volga. About 372 A. D. they moved westward and conquered first the Alani, who lived between the Volga and the Don, then the Ostrogoths, driving the greater part of the Visigoths across the Danube. The districts quitted by the Goths were occupied by the Huns. This, their first wave of invasion seems then to have subsided; and, though it was followed by more than one small afterwave, it was not till 430 A. D. that the second and greater wave began to form. Their chief, Rugulas, became so powerful that in 432 Theodosius II, emperor of Byzantium, was forced to give him a tribute of 350 pounds of gold. In 433 he was succeeded by his famous nephew Attila (whom see). Under Attila, who called himself the Scourge of God, Illyria and all the region between the Black Sea and the Adriatic were overrun. Theodosius was conquered in three battles, and Thrace, Greece and Macedonia were laid waste. Attila next marched through Germany and crossed the Rhine, the Moselle and the Seine. But at the battle of Chalons (451) he was utterly defeated by an army of Romans, Franks and Visigoths under Theodoric and Aëtius, in one of the bloodiest as well as most important battles of European history. Yet the next year he had strength enough to overrun Italy and would have taken Rome, had it not been for the visit to his camp of Pope Leo I, who is said to have overawed him by his sacred character. But the battle of Chalons was the real deathblow to the Hunnish empire, which quickly fell to pieces after the death of Attila in 453. Another defeat in Pannonia by the Goths, Gepidæ, Suevi, Herulians and others scattered them for good. Some settled in Dobrudja, others in Dacia, while the main body seem to have gone back to the land from which they came — the region about the Ural.

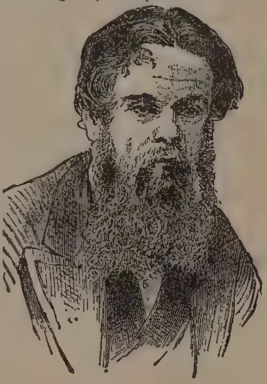
The Huns were of a dark complexion, deformed in appearance, uncouth in their movements and with shrill voices. Gibbon speaks of their "broad shoulders, flat noses and small, black eyes deeply buried in the head." According to an early fable they were sprung from witches and imps. Like the Mongols, they were a race of horsemen. They fought with bone-tipped javelins, sabers and slings or lassoes. They ate herbs and half-raw meat, which they first used as saddles; and they clothed themselves with the skins of wild animals. See Gibbon's *Decline and Fall of the Roman Empire* and Miss Yonge's *Young Folks' History of Rome.*

Hunt, Helen ("H. H.") See JACKSON, MRS. WILLIAM S.

Hunt, James Henry Leigh, English poet and essayist, was born at Southgate, close to London, Oct. 19, 1784. Hunt spent eight years at Christ's Hospital School in London. After some time as lawyer's clerk for one brother and four years in the war office with another brother, he set up a newspaper, *The Examiner,* in 1809. On Shelley's invitation to help him and Byron to found a quarterly magazine, *The Liberal,* he set sail for Leghorn in 1821, but arrived only a week before Shelley's death. *The Liberal* lived only for four issues, and soon Hunt was back in England. The remainder of his life was one of never-ending activity and never-ending money troubles, for, as he said, "he never knew his multiplication table." The critics called Hunt and Keats the Cockney poets. Leigh Hunt's poetry is now little read, but is witty and clever. His translations are among the choicest of their kind. Among his writings are *The Story of Rimini, The Palfrey, Lord Byron and His Contemporaries, Imagination and Fancy, The Old Court Suburb.* He died on Aug. 28, 1859. See his *Autobiography* and *Leigh Hunt* by Professor Dowden in Ward's *English Poets.*

Hunt, Richard Morris, an American architect, brother of William Morris Hunt, was born in 1828. At an early age he studied and traveled in Europe, Egypt and Asia Minor, afterward working on the buildings that connect the Louvre and the Tuileries. After 1855 he distinguished himself in the United States by the extension of the Capitol at Washington, Lenox Library in New York City, the pedestal for *Liberty Enlightening the World,* magnificent and palatial private houses and Yorktown Monument. American architecture was and still is deeply influenced by him. He had many distinguished pupils, and was a founder of the Institute of Architects. He died in 1895.

Hunt, William Holman, English painter, was born at London in April, 1827. He first tried business life, but in 1845 became an art-student at the Royal Academy. In 1848 Hunt shared his studio with Dante Gabriel Rossetti; and the two, with Millais and other young painters, started the pre-Raphaelite Brotherhood, whose members aimed at truth to nature in their work. *Our English Coasts, The Light of the World* and *The Awakened Conscience* are some of the pictures painted in this part of his life. In 1854 Hunt set out for Palestine to study eastern life and the local coloring and surroundings of Bible story. As a result of several visits he painted *The Scapegoat, The Shadow of Death, The Triumph of the Innocents* and *The Finding of Christ in the Temple.* His *Afterglow in Egypt* has been called "that modern masterpiece of technical art," and *Isabella* is his finest work in respect of coloring. He died Sept. 7, 1910.


W. HOLMAN HUNT

Hunt, William Morris, an American artist, was born in 1829 in Vermont, and became the one important figure-painter among the American artists of his time. He studied at Duesseldorf and with Couture and Millet, bringing the latter's influence into American art. He always was a forceful technician, and many of his smaller pictures have great charm, fine color and masterly execution. His chief works include *The Prodigal Son, A Peasant of Brittany, Portrait of Chief-Justice Waite, Seacoast at Magnolia* and, above all, the mural decorations in the Capitol at Albany. His portraits are exceptionally expressive of character; his landscapes large in style and vigorously executed; his wall-pictures the first large ones painted by an American that possessed artistic importance. The Capitol's new ceilings and walls conceal them. The artist died in 1879, about a year after painting them.

Hun'ter, David, was born at Washington, D. C., July 21, 1802. He graduated from West Point in 1822. Entering the army, he became captain of dragoons, and left the service in 1836. But he re-entered the army as paymaster in 1842 At the breaking out of the Civil War, Hunter was made colonel of the 6th United States cavalry. He commanded a division at Bull Run and was wounded. In 1862 he was in command of the department of the south and abolished slavery in his department; but this order was countermanded by President Lincoln. Hunter defeated a Confederate force at Piedmont on June 5, 1864. He died at Washington, D. C., Feb. 2, 1886.

Hunter, John (1728–93), a distinguished Scotch anatomist and surgeon from whom is named the great Hunterian Museum in London. He did important work in comparative anatomy, and is one of the fathers of zoological science. His brother William (1718–83), famous as a surgeon, founded the Hunterian Museum at Glasgow University.

Hun'tington, Ind., city and county-seat of Huntington County, is on Little River, about 20 miles southwest of Fort Wayne. The city has excellent waterpower, and manufactures boots, shoes, barrels, plows, bicycles, pianos, lime, and cement, and, besides, has foundries and woodworking factories. The city has a trade in coal and lime, because of the coalfields and limekilns near by, and also in agricultural products. Located here is United Brethren College. The city has a public library, owns and operates its water and lighting plants, and is served by the Chicago and Erie and Wabash railways. Population 10,220.

Huntington, W. Va., the capital of Cabell County, on the Ohio River, founded in 1871, and named after the late C. P. Huntington, then president of the Southern Pacific Railroad. It lies 50 miles west of Charleston, the state capital, in a picturesque agricultural region, reached by the Chesapeake and Ohio, Guyandotte Valley and Ohio River railroads. Here is the seat of Marshall College (the state normal school), Douglas High School (for colored youth) and the West Virginia Asylum for incurables. Huntington has an excellent public-school system, its high school giving a four years' course. It is the shipping point for a large trade in coal, iron and lumber; its industrial establishments include railway, machine and car shops, saw and planing mills, manufactories of glass, stoves, bricks, woodwork, paints etc. The city is beautifully laid out, and has a population of 31,161.

Hunts'ville, Ala., a city and county-seat of Madison County, 96 miles from Birmingham. It is in the center of a fine agricultural, cotton, fruit and stock raising region, known as the Tennessee Valley. It has great importance as a manufacturing city in the south, and is second only to Lowell, Mass., in cotton manufacturing, having nine mills, with a combined annual output of $4,775,000. Besides these, Huntsville has cottonseedoil mills, planingmills, heading, fibre, spoke and handle factories, machine shops, foundries and brick plants.

Huntsville has a number of private schools, a public-school system and, close to the city, the Agricultural and Mechanical College for Negroes. It has all the adjuncts of a progressive city, and owns and operates its waterworks. Water is supplied from a spring having a daily capacity of 2,400,000 gallons. This "Big Spring" attracted the city's first settler, John Hunt, a Virginian soldier of the Revolution. He built his cabin here in 1805, and brought his family from Tennessee in 1806. The settlement was incorporated in 1811 as Huntsville. It is served by the Nashville, C. and St. L. and Southern railways. Population 7,611.

Hunyady (*hoon'yŏd-ē*), **Janos.** John Corvinus Hunyady, governor of Hungary, one of the greatest war-captains of his age, was born near the end of the 14th century. His life was one unbroken crusade against the Turks. From 1437 to 1456 he was the shield of Hungary, not only against foreign foes, but against the lawlessness of the nobles at home. In 1442 he drove the Turks out of Transylvania, followed by a brilliant campaign south of the Danube in the next year; but his greatest exploit was the storming of Belgrade in 1456. Hunyady was governor of the kingdom from 1445 to 1453, and the royal line was wholly displaced when his son Matthias came to the throne He died on Aug. 11, 1456.

Hu'ron, Lake, the second largest of the five Great Lakes, on the frontier between the United States and Canada, is joined to Lake Superior by St. Mary's River and to Lake Michigan by the Strait of Mackinaw. The lake is divided into two unequal parts by Cabot's Head Peninsula and Grand Manitoulin Island, the parts to the north being called North Channel and Georgian Bay Its greatest length is 263 miles and greatest breadth — without Georgian Bay — 105 miles. Its greatest depth is 750 feet, and it is 581 feet above sealevel. It often has violent storms, like the other Great Lakes There are about 3,000 islands in the lake. The water is very clear and pure, and fish are abundant. Good harbors are plentiful, and at Sand Beach, Mich., there is a harbor of refuge. See Crossman's *Chart of the Great Lakes.*

Hurons, a once-powerful tribe of American Indians belonging to the great Huron-Iroquois family. Their home was near Georgian Bay, Lake Huron. Their own story of their origin was that a woman fell from heaven into the ocean. Then the tortoise and the beaver dived, and brought up earth to make land, where she rested and bore two sons. The son of one of these twins, called Tharonhiawagon, was worshiped by the Hurons and the Iroquois. The tribe was divided into clans, each ruled by a sachem. Their totem was the porcupine. For an Indian tribe their country was very small, only about 75 miles long and 25 miles wide. When first met with by the French, they were 30,000 strong, living in 25 towns. In 1609 the French, under Champlain, found the Hurons allied with the Algonquins and fighting the Iroquois. By 1648 the Hurons were so weakened by disease that they fell an easy prey to the Iroquois, who had been given guns by the Dutch. Their towns destroyed, the Hurons scattered, some joining the Iroquois, others carried by the French to Quebec. See Kip's *Early Jesuit Missions in North America* and Chamberlain's *Ethnology of the Aborigines* in the British Association's *Handbook of Canada.*

Hurst, John Fletcher, an American divine, and bishop in the Methodist Episcopal church. He was born near Salem, Md., Aug. 17, 1834, and studied theology at Halle and Heidelberg, Germany. He returned to the United States in 1856, and became pastor of various churches until 1866, when he was given charge of the Methodist Missionary Institute at Bremen, Germany. He remained there for three years, and in 1871 again returned to the United States, and was made professor of historical theology at Drew Seminary, Madison, N. J., becoming president in 1873. In 1880 he was elected bishop. In 1891 he became chancellor of the American University (Meth.) at Washington, D. C. He was the author of *History of Rationalism; Life and Literature in the Fatherland; Bibliotheca Theologica; Short History of the Reformation; Indika;* and *History of the Christian Church.* He died on May 4, 1903.

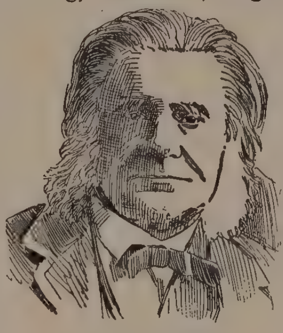
Huss or **Hus, John,** a Bohemian reformer, was probably born in 1369. At the University of Prague he became acquainted with the writings of Wiclif, an English reformer, and in 1408 preached against the abuses of the clergy. His preaching won the people, and nothing stopped him, not even excommunication in 1410. Next year he spoke still more boldly, but nearly all the nobles stood by him. He was later summoned to a church-council at Constance, was imprisoned there in spite of having been promised protection, and in 1415 was illegally tried and condemned. He remained loyal to his evangelical beliefs, and so was burned to death as a heretic on July 6, 1415. His followers held together, finally forming the Unity of Brethren that is commonly called the Moravian (or Bohemian) Brethren, and a century later, when Luther arose, they were a large and powerful body of Evangelical Christians. The writings of Huss, which are Wiclif's, greatly influenced Luther.

Hutch'inson, Anne, a religious leader was born in Lincolnshire, England, about 1590, and murdered by the Indians in Connecticut in 1643. At first her zeal in religious matters met with some sympathy from the Rev. John Cotton; but after a time the famous minister came to dread her leanings to the antinomian heresy, and in 1637 she was excommunicated from his church. Anne Hutchinson and her friends, by permission of the Indians, founded a settlement in Rhode Island, where all differences of religious opinion were to be tolerated. Only after her husband's death did she remove to Stamford, Conn., where she and her family, except one daughter, were massacred. See *Life* in *Library of American Biography.*

Hutchinson, a city and county-seat of Reno County, Kan., 40 miles west of Wichita on the Arkansas River. It manufactures lumber, machinery, boilers etc. It is an important meatpacking and shipping point, but its chief business is the salt industry. In 1887 rock-salt was discovered here, and 6,000 barrels are now produced daily. Hutchinson has a good public school system, a high school, a public library, the state reformatory. It is well served by the Santa Fe, Missouri Pacific and Rock Island railroad systems. Population (1910) 16,364.

Hut'ton, Maurice, was born in Manchester, England, and educated at Magdalen College School and Worcester College, Oxford. Fellow of Merton College, 1877–80, he lectured on classics and ancient history at Firth College in 1880. He has been professor of Greek since 1887, and principal since 1901, of University College, Toronto.

Hux'ley, Thomas Henry, was born at Ealing, Middlesex, England, May 4, 1825. He studied at the medical school of Charing Cross Hospital. After receiving his degree in 1846, he entered the medical service of the royal navy as assistant surgeon of the *Rattlesnake.* The staff of this ship surveyed the passage within the great barrier reef skirting the eastern shores of Australia, and explored the sea between the northern end of that reef and New Guinea. Huxley plunged eagerly into the study of the many sea-animals gathered during the survey, and made them the subjects of valuable scientific papers, the most important being *The Oceanic Hydrozoa,* which was not published until 1859. In 1854 he was made pro-



T. H. HUXLEY.

fessor of natural history in the Royal School of Mines, London, and held that position till 1885. He was the first great teacher of biology by the laboratory method. With his assistant, Dr. Newell Martin, he published, in 1874, the famous *Practical Biology*, which was the means of introducing laboratory work in that department into the United States and some other countries. He was also interested in general education, and served a term as member of the London school board. He was the best popular exponent of science that the world has known, and in other respects a man of commanding intellectual power. He defended and explained Darwin's hypothesis of evolution with telling effect. Perhaps his greatest service was in promoting the advance toward intellectual honesty. Many of his works, like *The Physical Basis of Life*, *Lay Sermons*, *Man's Place in Nature*, *Critiques and Addresses* and *Science and Culture* are famous, and his controversial writings are also well known. His scientific researches fill four large octavo volumes, and his collected essays and books of a less technical character were published in 1892 in nine volumes. He died at Eastbourne, June 29, 1895. See *Life and Letters* by his son.

Huygens (*hoi'gĕns* or *hī'gĕnz*), **Christian,** "the Dutch Archimedes," was born at The Hague in 1629, and died there in 1695. A splendid ancestry, three years of university training and much travel combined to give him a liberal education. Most of his life was spent in Holland, but for 15 years following 1666 he worked in Paris under the patronage of Louis XIV and the French Academy of Sciences. His mathematical discoveries are important, but his chief distinction lies in the domain of physics, where he gave a general solution of the problem of the compound pendulum; invented the pendulum clock and applied it to the measurement of the acceleration of gravity at various parts of the earth's surface; discovered the laws governing the collision of bodies and centrifugal forces; suggested the wave-theory of light and applied it to the explanation of reflection, ordinary refraction and double refraction; and constructed the first powerful telescope of the refracting kind, discovered the rings of Saturn and its sixth satellite and improved the method of grinding and mounting lenses. All his work is characterized by practicability, clearness and elegance. A complete edition of his works has been (1888) published at The Hague.

Hy'acinth, the species of *Hyacinthus*, a genus of the lily family, containing about 30 species, most of which are natives of South Africa. The common hyacinth (*H. orientalis*) is native to Syria, Asia Minor and Greece. It has long been cultivated and occurs in many varieties. Though a harbinger of spring, it is more of a hot-house than garden-flower.

Hy'acinthe, Pére (*par ē'ă'sănt'*), was the former monastic name of Charles Loyson, who was born at Orléans, France, March 10, 1827. He studied at St. Sulpice, and in 1851, becoming a priest, he taught philosophy and theology at Avignon and at Nantes. Afterwards he became a Carmelite, came into notice as a powerful preacher, and gathered crowds from all ranks of society to hear him at the Madeleine and at Notre Dame in Paris. He was "silenced" because of unorthodox utterances; but, persisting in his course, he was excommunicated in 1869. One of the changes which he urged was that priests should be allowed to marry, and in 1872 he married an American woman. He died in Paris, Feb. 9, 1912.

Hyderabad (*hī'dẽr-ă-băd'*) or **Haidar'abad,** capital of the Indian feudatory or native state, under British administration, of the same name, stands on the River Musi, 1,700 feet above the sea. It is one of the most important Mohammedan strongholds in India, and has many mosques. Wild and picturesque scenery surrounds the town, and the neighborhood is laid out in beautiful gardens and huge parks. Area of the state 82,698 square miles; population 13,374,676; population of the city, with suburbs, 500,623.

Hyder Ali (*hī'der ä'lē*), ruler of Mysore and one of the greatest Mohammedan princes of India, was born in 1728. In 1749 his bravery at a siege brought him to the notice of one of the ministers of the maharajah. He soon became, in all but name, ruler of the kingdom. He conquered many adjoining states, and in 1766 ruled over 84,000 square miles. When, in 1772, he was attacked by the Mahrattas, he claimed English help, in accordance with the treaty in force between them. This was refused, and he became the bitter enemy of the British. When, in 1778, the English were at war with the French, he and his son, Tippoo Sahib, descended on them like a thunderbolt, wholly routed two commanders, and ravaged the country to within 40 miles of Madras. He was at last defeated in three battles by Sir Eyre Coote. He died in December, 1782.

Hyde Park, a famous London Park which covers, in the district of Westminster, 400 acres, reaching from the western end of London to Kensington Gardens. It was once part of the manor of Hyde, which belonged to Westminster Abbey. When the monasteries were dissolved under Henry VIII, these grounds came into possession of the crown, and in the reign of Charles II were (and remain) the great drive and walk of London.

Hyde Park, Mass., town in Norfolk County, on Neponset River, about four miles from Boston. It manufactures paper, morocco, cotton and woolen goods, dyestuffs, looms, curled hair, chemicals and machinery. The town is a residential suburb, has good schools and a free library, and is served by the N. Y. N. H. and H. Railroad. It was incorporated in 1868. Population 15,507.

Hy'dra, a small fresh-water animal of low grade of organization. It has a tubular body, about the size of a knitting needle and from one quarter to five eighths of an inch long. This is capable of being extended and contracted into almost a globular form. One end of the body is attached, and the other is developed into a circular disc surrounded by a circlet of six or eight tentacles. In the middle of the disc is a mouth which leads into a general cavity or stomach. The body, therefore, is a hollow tube. It is composed of two cell-layers, an outer and inner layer (*ectoderm* and *endoderm*). A thin supporting layer is formed between the two, which foreshadows the middle layer (*mesoderm*) found in connection with the others in all higher animals. The hydra has two cell-layers, but the bodies of all higher animals have three cell-layers. (See Development.) Hydræ live singly, and propagate both by budding and by eggs. The budding is very interesting. When they are well-fed, a bud will start from the parent forms which soon develop into tubular bodies. Later, discs and tentacles are added. The buds are usually set free after the development of a mouth, but sometimes a second bud (or more) will start and reach the feeding condition before any are set free. In many marine animals (*hydrozoa*) a similar process of budding occurs, and the new forms produced all remain together permanently. The entire group grows, and budding continues until branching colonies of considerable extent are produced. See Coral and Hydrozoa.

Hydrau'lic En'gines or **Mo'tors,** are often used where water can be got under high pressure. They do not differ essentially from steam engines (which see). The water acts by difference of pressure — that is, it is let in at a high pressure at the beginning of the stroke, and let out at a low pressure at the end of the stroke, thus giving a back-and-forth motion to the piston. The speed of the piston has to be kept low to avoid hurtful shocks in suddenly bringing the column of water to rest. Since hydraulic engines work under very much greater pressures than steam engines — usual pressure 700 pounds per square inch — they can be much smaller. A common form is the three-cylinder, single-acting engine. In each cylinder works a plunger; water is let in by valves behind the plungers, and forces them out. At the end of the out-stroke, the water pressure is cut off, and the exhaust valve opened, allowing the plunger to push the water out of the cylinder on the return stroke, and so on.

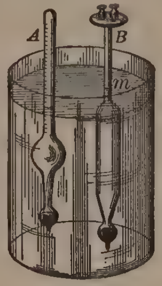
Hy'drau'lics, the science which treats of the flow of water. It is partly theoretical, based on the general laws of fluid motions as developed in physics, but largely experimental. It has to do with the flow of water through orifices, pipes and canals and over weirs and dams and with the use of rivers and streams for power purposes. (See Water-Wheels.) The designing of canals, aqueducts and pipe-lines for drainage and public water-works is an important application of the science of hydraulics.

Hy'drochlo'ric Acid. See Acid.

Hy'drocyan'ic Acid. See Acid.

Hy'drogen, one of the elements and the lightest gas known. It is colorless, odorless, and not poisonous. It burns with a non-luminous flame, which produces great heat and forms water. At a very low temperature it can be changed to a liquid and, finally, to a transparent solid. Liquid and solid hydrogen are only about one fourteenth as heavy as water, and in these conditions also hydrogen is the lightest known substance. Combined with oxygen, it forms one ninth part by weight of water, and it plays a most important part in the makeup of tissues of animals and plants. It also is in a large number of manufactured substances and products, as starch, sugar, vinegar, gutta-percha, alcohol, ether, benzine, aniline, indigo, morphia etc. In fact, it is a constituent of practically all organic substances. It is not found largely in a free state, but in some places it comes out of the earth with other gases in natural gas, as in the petroleum regions of Pennsylvania. It is usually prepared by the action of acids on metallic zinc or iron. As it is the lightest gas known, it is used as a standard to measure the densities of other gases. The air of the atmosphere, for example, is 14.5 as compared with hydrogen as 1; moreover, as the weight of an atom of hydrogen is less than that of an atom of any other element, the atomic weight of hydrogen is taken as a measure, and those of other elements referred to it. Compounds containing hydrogen and one other element are products of decaying vegetable and animal matters, as marsh gas, ammonia and hydrogen sulphide.

Hydrom'eter, an instrument employed in science and commerce to determine the densities of bodies. It consists essentially of a slender floating body, heavily ballasted at the lower end. There are two principal forms. The simpler form is made of glass, the lower end being provided with a bulb partly filled with mercury as ballast, the upper end being a hollow graduated stem. This form is marked *A* in the accompanying figure. The depth to which the stem sinks evidently depends upon the density of the liquid in which it is



HYDROMETER.

placed. By placing the hydrometer in liquids of known densities it may be graduated empirically; and may henceforth be used to measure the unknown density of a liquid. The distinguishing feature of this form of hydrometer is that *the weight of liquid displaced is a constant.* The second form, which is generally ascribed to Nicholson but is really due to Robert Boyle (1675), is a floating body provided with a fiducial mark. The density of any liquid is determined by the weight which must be placed upon the hydrometer to sink it to the fiducial mark in this particular liquid. [A fiducial line or point is a line or point of reference, as for setting a scale used for measurements.] This form of hydrometer is sometimes used for weighing bodies in water and out of water; and in this way it may be used to determine the specific gravity of solids. The characteristic feature of this second form of hydrometer is that the *volume* of liquid displaced is constant. A great many special modifications of these two forms are to be found. For these consult any good laboratory manual of physics or chemistry.

Hy′drophytes. The name literally means water-plants. The water conditions in which such plants grow range from complete submergence to swamps. Such plants have various adaptations for living in connection with a large amount of water. If the plant lives submerged, there is a feeble development of the tissues for mechanical support, and when it is removed from the water it collapses. Another common adaptation of water-plants, found also in swamp forms, is the development of conspicuous air-passages for aëration. Stalks of water-lilies, calladiums etc. easily show these large passageways. It is necessary for air to be brought into the plant and carried to parts which are too much shut off from air by water. In certain plants which float, bladder-like floats are provided, as in the common bladderworts. There are three conspicuous types of hydrophytes. The first type is made up of the "free floating societies," that is, those in which the plants are entirely sustained by water and are free to move either by locomotion or water currents. To this group belong the ordinary pond societies, composed of algæ, duckweeds etc., which float in stagnant or slow-moving water. The second type is made up of the "pondweed societies," in which the plants are anchored, but their bodies are submerged or floating. Here belong the associations of seaweeds, among which there are often elaborate systems of holdfasts. Another conspicuous pondweed society is that which contains among its representatives the water lilies with their broad floating leaves and the pondweeds or pickerel weeds with entirely submerged leaves. The third type is made up of "swamp societies," in which the plants are rooted in water or in soil rich in water, but the leaf-bearing stems rise above the surface. The conspicuous swamp societies are "reed swamps," characterized by tall rushes, cat-tails and reed grasses, wandlike monocotyledons which usually form a fringe about shallow margins of small lakes and ponds; "swamp moors," the ordinary swamps, bogs, marshes etc., which are covered by coarse grass; "swamp thickets," in which there is a tangle of willows, alders etc.; "sphagnum moors," in which the sphagnum moss prevails and is accompanied by numerous orchids, heaths etc.; "swamp forests," in which the tamarack (larch), spruce, pine, hemlock and juniper are the prevailing trees.

J. M. COULTER.

Hydrotropism (*hī-drŏt′rō-pĭz′m*), the sensitiveness of a plant to the presence of moisture in greater amount on one side, to which it responds by so altering the rate of growth as to curve toward or away from the source of moisture. Thus the mycelium or nutritive part of fungi grows towards moisture; the reproductive parts generally away from it. In the higher plants this sensitiveness is shown most strikingly by roots. If roots of corn are growing straight downward by geotropism (which see), they will be deflected in a few hours toward a sheet of wet blotting paper hung near them. Growth is accelerated on the side where the air is drier, but is retarded on the moister side. As this is exactly the reverse of the direct influence of moisture, it is clear that the result must be an indirect one, due to irritability (which see).

Hy′drozo′a. Sometimes casual visitors at the seacoast gather certain animal forms from rocks and submerged objects, and press them on paper under the name of seaplant or seamoss. This shows how much some of the hydrozoa resemble delicately branching plants. The general stem is usually horny and hollow. At various points are small, tubular polyps resembling the fresh-water hydra in form and structure. While it is solitary, they are colonial. In this group also the polyps have become modified into several kinds of persons. The feeding persons — with tubular body disc and tentacles — are the most typical. The reproductive persons are often shaped like small jellyfish, and are set free from the colony when fully formed. They are called medusoids. There are in some colonies, in addition to the above, protective persons, swimming persons and stinging persons. These are all modified polyps, and the variety of form gives rise to what is called polymorphism. The hydrozoa make a natural division of the subkingdom *Cœlenterata* (which see). See HYDRA.

Hye′na an ungainly, carnivorous mammal of southern Asia and the continent of Africa. The hind quarters are lower and weaker than the fore quarters, which gives them an awkward shambling gait. The body is covered with rather long, coarse hair, which, along the neck and back, forms a mane. The smallest forms are the size of a large dog, and the largest ones approach the tiger and lion in size. They all have powerful jaws and teeth capable of crushing the hardest bones. They sometimes kill living prey, but feed mainly upon carrion and carcasses left by the lion or other beasts. They prowl at night and dig into graves, and are, therefore, regarded with fear and horror. They, in reality, are of a cowardly disposition and less ferocious than they are commonly believed to be. They have been tamed and kept in place of dogs. There are three varieties. The striped hyena of southern Asia and nearly all Africa is in general brownish-gray with dark cross-stripes on the sides of the body. They live in caves by day and hunt in packs at night. The brown hyena is found in Cape Colony. The spotted hyenas live in southern Africa. They are smaller than the largest varieties of striped hyena, but more dangerous and fierce. Besides howling, this form makes a noise like hysterical laughter, which has gained for it the title of the laughing hyena.

Hygiene. (*hī′jĭ-ēn*) is the name given to that department of inquiry which deals with the causes and prevention of disease in their relation to the preservation of health. As thus defined, hygiene, while founded on medical experience and advanced by medical research, stands out clear and defined from the ordinary run of the science and art of medicine, which deal with the cure of disease. The aim of hygiene is to prevent disease by the due appreciation of the causes which induce a departure from the normal type of healthy life. In this sense hygiene has well been named preventive medicine, since it seeks to anticipate the work of the physician by its endeavor to remove the causes on which the diseases that affect mankind depend. Hygiene presents for consideration two chief phases. The first section, *Personal Hygiene*, relates to the individual as a unit and to his duties in maintaining health and preventing disease. The second section deals with *Public Health*, and concerns the relations which exist between masses of men and the conditions of healthy living. In the first case the study embraces such subjects as food, clothing, habits, heredity and the like, which relates to the personal history of the unit. In the latter case hygiene has to regard the community and the nation and to investigate the laws under which disease is liable to be propagated by the circumstances of collective life. The departments of hygiene which deal with drainage, healthy houses, the removal of waste and the prevention of infectious disease illustrate the subjects with which the health-officer concerns himself.

It is in the 18th century that hygiene begins to appear on the social horizon with something of clear outline and defined aims, as a distinct branch of science, pursuing a very practical relation to the lives of men. The sanitary historian has to take account of at least three great names as those of forerunners in the work of hygienic progress John Howard, the philanthropist, largely based his work of jail-reform on improvement in the terrible state of these places of confinement. They were overcrowded and filthy in the highest degree, and as a consequence of these conditions typhus fever (which is a disease of overcrowding) reigned rampant under the name of jail-fever. Howard, by his undaunted efforts, succeeded in clearing the jails of this pest; and to-day our criminals reap the fruit of Howard's philanthropy in the fact that the jail now ranks in reality as the healthiest of dwelling-places. Captain Cook, the navigator, stands out as the second of the sanitary pioneers of the last century. He it was who first showed that scurvy, which essentially is a blood disorder and from which whole ships' crews used to remain prostrate during long voyages, is due to improper feeding. He showed that, in the absence of fresh vegetables, lime juice should be served out regularly to ships' crews. To-day Captain Cook's discovery is duly acted upon in the case of long voyages. The third discovery of importance in the 18th century is that of vaccination by Jenner, which was introduced into practice about 1796.

The advance of medical science — especially the progress which has been made in microscopic research into the causes of disease — together with the spread of education and of a consequent intelligent interest in health science among the people, has tended powerfully to awaken national endeavor in matters both of personal and public hygiene. To-day it may be said that we possess a very fairly equipped staff of health experts in every large town, able and eager to assist and advise the citizens in the discharge of their manifest duties to themselves and their neighbors in the observance of hygienic rules. One of the most important enactments, for instance, is represented by the law which in many towns makes compulsory the notification to the authorities of every case of contagious disease which falls under the notice of the householder or medical attendant or both. In this way it is sought to limit the spread of those infectious ailments which add to the death-rate each year. The authorities, being early informed of the appearance of any cases of these diseases, can take prompt measures for their isolation and their removal, if need be, to the hospital. The seaports, too, are now narrowly watched by the health-officers of these ports, and suspicious cases of illness on vessels arriving in harbor are at once dealt with. Cholera, it may be mentioned, which has run unchecked on the continent of Europe on several occasions within late years, has thus been warded off from the American coasts by the active supervision of the health-authorities at the ports.

Within the sphere of the home health science has of late years made satisfactory progress. The principle of safe and sanitary drainage, whereby a house can be trapped off efficiently from the public sewers and the inroads of sewer-gas (giving rise to typhoid fever and other ailments) prevented, is beginning to be everywhere practiced. In other details, also, the health of our homes is receiving the care it deserves. Questions of ventilation and of lighting are being studied anew, and the warming of houses is no longer left to chance. Personal health, which ranges in its extent from questions of foods and drinks to those of cleanliness and clothes, is not neglected amid the general improvement in hygienic education; so that the outlook in health questions is, on the whole, of the most hopeful kind. Happily, the people at large are beginning at length to perceive and to act on the great truth that only by their personal education in hygiene, and by their knowledge and observance of health laws, can they secure the length of days which of old it was declared Wisdom bore in her right hand.

Hygrom'eter (*hygros* means moisture, *metron*, a measure), an instrument used to measure the amount of moisture in the air at any particular time. The hygrometric condition of the air is indicated by the ratio of the amount of moisture in the air at the particular time to the amount that it is capable of holding at that temperature.

The earliest instruments did not afford a means of determining this scientifically. The hair hygrometer or, rather, hygroscope simply indicated roughly whether the air was comparatively wet or dry. The hair expanded on a damp day and contracted on a dry day.

The wet and dry bulb hygrometer consists of two thermometers exactly alike, fastened side by side on a stand, the bulb of one of which is covered with muslin. The muslin is connected with some sort of wick arrangement leading to a jar of water. The idea is to have water conducted up the wick to the muslin surrounding the bulb, the thin character of the muslin giving the water a good chance to evaporate as rapidly as possible. The evaporation, of course, causes a fall of temperature in the bulb underneath. The drier the day, the faster the evaporation and the greater the fall in temperature of the muslin-covered thermometer. The other thermometer records the actual temperature of the air, and by comparing the two and using a set of prepared tables the hygrometric condition can be determined.

There are several other forms of hygrometer, the most scientific of which, perhaps, is that of Regnault. This instrument is similar in principle to the wet and dry bulb hygrometer, but it is much more precise in construction and makes use of the very rapid evaporation of ether, instead of the slower evaporation of water, to reduce the temperature of one of the bulbs. By this means one of the thermometers can easily be cooled down to the dew-point, that is, the temperature at which the moisture of the air begins to condense as dew. Having the dew-point and also the temperature of the air as given by the other thermometer, the ratio of the amount of moisture in the air to the amount that it is capable of holding can be determined.

Another form of hygrometer is that in which a definite volume of air is passed over a substance, as calcium chloride or sulphuric acid, that will absorb all of its moisture. This substance is carefully weighed, both before and after the known quantity of air is passed over it, and the increase in weight will be the weight of water in the quantity of air passed over.

Hyksos (*hik'sōz*) (meaning shepherd kings), the name given to the kings of Egypt of the 15th, 16th and 17th dynasties. Their capital was Tanis, called Zoan in the Bible. The Hyksos were not the Hebrews, but probably were wandering tribes of Arabia and Syria, mostly Canaanites. They became Egyptians in manners and customs, even worshiping the Egyptian gods. They ruled for about 500 years, from 2200 B. C. to 1700 B. C. or, according to other accounts, from 2000 to 1500. See Sayce's *Ancient Empires* and *Races of the Old Testament.*

Hymet'tus, a ridge of mountains, four miles east of Athens, which reaches a height of nearly 3,000 feet, is famous since ancient times for its honey. The honey appears to be flavored by the wild thyme upon which the bees pasture. Hymettus marble from the mountain quarries has also had a reputation for beauty even from the days of the ancient greatness of Attica.

Hypa'tia a Greek philosopher, daughter of Theon, an astronomer of Alexandria. She was renowned for her knowledge of mathematics and the Platonic philosophy, of which she was a teacher at Alexandria. She was also celebrated both for beauty and modesty. She met a tragic fate. Being accused by the clergy of undue influence over Orestes, prefect of Alexandria, against Cyril, then archbishop there, she was attacked by a mob led by monks, dragged into a church, stripped of her clothing and killed. This occurred about 415 A. D. Hypatia has been made the subject of a romance by Charles Kingsley.

Hy'pha (in plants). The individual thread of the mycelium of a fungus. See Fungi.

Hyp'notism. This term covers the phenomena associated with an abnormal mental condition resembling somnambulism. The special characteristic of the hypnotized person is liability to suggestion from some one else, ordinarily the one by whose influence the subject is hypnotized This means that whatever is suggested by the hypnotizer is believed or done by his subject, who seems to have given over his will to this control. The subject may be made to eat with apparent relish objects ordinarily disagreeable to taste or to reject dainties with disgust. He may be made to perform ridiculous antics or find it impossible to close his eyes or to raise his arm. When the hypnotizer suggests that his subject is in a certain condition or should act, feel or think in a certain way, the latter becomes possessed by the idea thus presented and is unable to resist the tendency to carry his thought into action. In the hypnotic condition one may become abnormally rigid (cataleptic), insensible to pain so that a needle thrust through the hand may not hurt or, perhaps, extraordinarily sensitive to certain sights, sounds or touches. After being roused from the hypnotic state, a result accomplished usually only by the suggestion of the hypnotizer, the subject ordinarily forgets all that happened while under the spell. He may, however, be made to carry out, after waking, suggestions given during hypnotism, or may spontaneously lapse into the condition at a suggested time or occasion.

The method by which one is hypnotized can not be said to be reduced to a science, but in general it is now admitted that the mysterious passes, stroking etc., usually employed, serve only to distract or diffuse the attention, so that the subject spontaneously lapses into the hypnotic slumber. In brief, one hypnotizes himself, and the skill of the hypnotizer lies in his ability to get his subject to do this. The supposition of Mesmer (1734–1815) that there are mysterious magnetic influences exerted by the body of the hypnotizer has been exploded.

Hypnotism possesses much therapeutic value, especially with nervous diseases, which can often be helped by suggestion. Bad habits, like the excessive use of tobacco or alcoholic drinks, may sometimes thus be broken up. Crimes have been committed as a result of hypnotic suggestion, but it is generally admitted that this is possible only when there are no ingrained scruples against them in the minds of the subjects. Indeed, as very few can be hypnotized against their will, very little can be successfully suggested that antagonizes the character of the subject. Consult Moll's *Hypnotism.*

Hypocotyl (*hī′pō-kō-tĭl*) (in plants). The stem-like portion of the embryo of seed-plants. The name refers to the fact that this part is beneath the cotyledons or first leaves. See EMBRYO.

Hyp′oder′mis (in plants). The name literally means beneath the epidermis, and usually refers to a supporting tissue which develops in that position. However, the word is often used quite generally, and is merely one of position. For example, a hypodermal cell merely means a cell of any kind immediately beneath the epidermis. Occasionally a definite tissue is developed beneath the epidermis, distinct from other tissues, and to this is very properly given the name hypodermis.

Hypogenous (*hī-pŏj′ē-nŭs*) **Flowers,** those in which the sepals, petals and stamens originate beneath the ovary In this case the ovary is often said to be "superior," that is, it is to be seen within the flower, arising above the origin of the other parts. The contrasting term is "epigynous." Hypogynous flowers are regarded as more primitive than those that are epigynous, as hypogyny prevails in all of the more primitive families. See FLOWER.

Hysteresis (*hĭs′tē-rē′sĭs*), a term employed in the science of magnetism to describe the fact that in substances which are magnetic the induction always lags behind the magnetizing force. The word is simply the Greek word for lagging behind. The most familiar illustration of this phenomenon is found in the case of a piece of iron which has been placed in a strong magnetic field and has then been removed from it. If the iron be hard, a considerable proportion of the induction remains even after the magnetizing force has been reduced to zero; and we have what is known as a permanent magnet. It has been shown that the amount of hysteresis in iron largely determines the amount of energy lost in heating the iron when it is used as the core of a transformer. Hysteresis, therefore, is a quantity of great importance to electric engineers. See Ewing's *Magnetization of Iron and Other Metals.*

I

I (*eye*), the ninth letter, is a vowel. Its original sound was *e* in *mete*. The principal sounds are a long sound, as in *pine*, and a short one, as in *pin*. It also has the long and the short sound of *e*, as in *machine* and *thirst*. When it precedes another vowel, it is a consonantal *y*, as in *Christian*. The dot over *i* came in the 13th century. Originally *I* represented *J* too, *J* originating by lengthening *I* below the line. Until recently, even after *J* got into English dictionaries, words beginning with *J* were grouped with those beginning with *I*. The Romans used it as a numeral (1) as well as a letter.

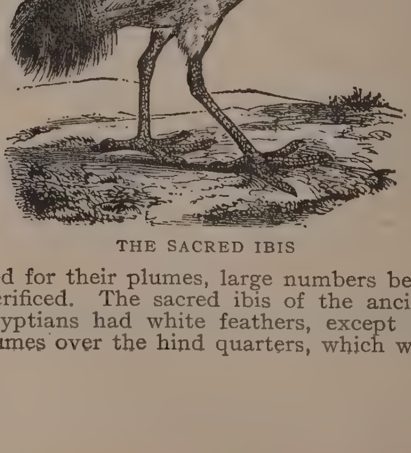
Ibe'rian Peninsula. The westernmost of the three peninsulas that project southwards from Europe into the Mediterranean. It is named for the ancient inhabitants, whom the Greeks and Romans called Iberi. Owing to the Pyrenees Mountains and the general position of the peninsula it has been somewhat shut out from the life of the rest of Europe.

Iberville (*dē bâ'rvēl'*), **Pierre le Moyne, Sieur d',** a French-Canadian explorer, was born at Montreal, July 16, 1661, and entered the French navy as midshipman while still a lad. He took part in the French expedition of 1690 to northern New York. He captured Fort Nelson from the British in 1694, took part of Newfoundland in 1696, and defeated them in the naval battles of 1697. In 1699 he entered the Mississippi River, and founded the first French settlement in Louisiana, at the head of Biloxi Bay. Returning from a visit to France in 1701, he transferred the Biloxi settlement to Mobile. In 1706 he captured the island of Nevis from the English. He died at Havana, Cuba, July 9, 1706.

I'bex, a mountain goat found wild in the Alps, Pyrenees, Caucasus and Himalayas. The family is divided into ibexes and goats proper. The ibexes have large horns crossed on the front surface by ridges and furrows. There are two kinds, the ibex of the Alps and that of the Pyrenees and Himalayas. The Alpine ibex (see illustration) or steinbok is about two and one half feet high at the shoulders, and may reach a weight of 200 pounds. It has become rare in the Alps, and is protected by law. The hair is reddish-gray in summer, turning to dead-gray in winter. The horns are large; they diverge backward and the points turn downward. In the male they reach a length of two or two and one half feet. The ibex lives above the snow-line during the day and descends at night to feed. The males for the most part live alone, higher than the females, but join their mates in January. The ibex of the Pyrenees has more divergent horns, with the tips pointing inward, and the transverse ridges are less prominent. Hunting the ibex is very difficult.

HEAD OF ALPINE IBEX

I'bis, any one of a family of wading birds related to storks and herons. It has a heavy, rounded, curved bill and feeds chiefly on reptiles, fish etc. Ibises are sociable birds, nesting together in colonies. Like herons and egrets, they have been slaughtered for their plumes, large numbers being sacrificed. The sacred ibis of the ancient Egyptians had white feathers, except the plumes over the hind quarters, which were

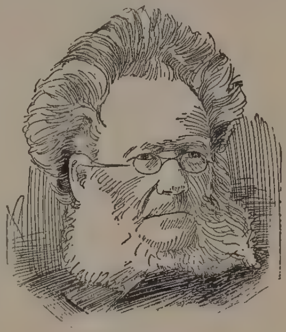


THE SACRED IBIS

black. The head, neck, legs and feet were destitute of feathers and covered with black skin. It was kept in temples and embalmed after death. It is doubtful if it occurs in Egypt to-day, north of Khartum. The bird pointed out to travelers as the sacred ibis usually is the buff-backed heron. The glossy ibises, of chestnut color, with head and neck feathered, are distributed over all the warmer parts of the globe. In North America two species are found. The glossy ibis is still to be seen in Florida and the southwest. The white ibis, only a few now remaining in Florida, is a snow-white bird, its whiteness emphasized by the black of the four outer wing feathers. The splendid scarlet ibis may no longer be found in its old haunts in Florida and Louisiana. The spoon bills are like other ibises, save as to the shape of the bill. The wood ibis, native of South America, breeds as far north as Florida. Formerly it was grouped with the ibises, but it leans toward the storks. On the sacred ibis see Wilkinson's *Manners and Customs of the Egyptians.*

Ibrahim Pasha (*ĭb-rȧ-hēm′ pä-shä*), viceroy of Egypt and son of Mehemet Ali, was born at Kavala, Rumelia (in European Turkey), in 1789, and died at Cairo, Nov. 9, 1848. During his father's viceroyalty (1811-48) dead Egypt enjoyed a galvanic prosperity, which was in great measure imparted by Ibrahim's success as a general. The wild tribes of upper Egypt were overrun in 1812; the Wahabees and part of Arabia fell before him in 1816; and in 1820 Nubia and part of the Sudan were added to Egypt, and Egyptian troops fought in aid of the Turks against the Greeks from 1821 to 1828. His greatest exploit, however, was the conquest of Syria in one year, beginning with the victories of Tripoli and Horus. Pushing into Asia Minor, he routed a Turkish army at Koniya and found an open road between him and Constantinople. But the Powers now stepped forward, and Egypt was obliged to be content with Syria, which she had won by force of arms. War again breaking out in 1833, another splendid victory at Nisib would perhaps have given Mehemet Ali the throne of Constantinople, but the Powers again called a halt, and Ibrahim was even forced out of Syria, of which he had been governor since its conquest. Ibrahim ruled as viceroy, however, only during the last two months of his life, being called to the government because of the childishness of his father, in 1848. Ibrahim's son was the first khedive of Egypt. See Stanley Lane-Poole's *Egypt.*

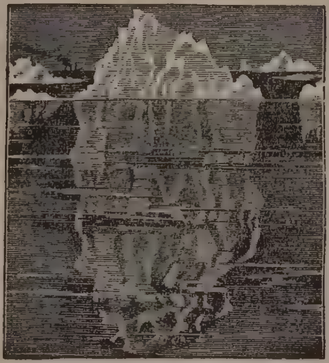
Ib′sen, (*ĭp′sen*), **Henrik,** a Norwegian lyric poet and dramatist, was born at Skien in southern Norway, March 20, 1828. He was a student at Christiania University, but did not graduate. He engaged in journalism for two years, and was then made director of Ole Bull's theater at Bergen. His first play, *Catalina*, was produced in Christiania in 1850. At Bergen he wrote *The Banquet at Solhaug* and *Lady Inger at Ostraat.* In 1858 he wrote *The Warriors of Helgeland;* in 1862 *Love's Comedy;* in 1864 *The Rival Kings.* These works gave him high rank among modern Scandinavian dramatists. In 1864 he left his native country and lived abroad for the most part until 1892. In 1866 the parliament of Norway granted him a pension. His dramas are partly in prose, partly in verse, and include historical plays and satirical comedies of modern life. His later works include *Brand*, *The Pillars of Society*, *A Doll's House*, *Ghosts*, *An Enemy of the People*, *Little Eyolf*, *Hedda Gabler* and *The Master-Builder.* Most of these have been published in English. He died on May 23, 1906.



HENRIK IBSEN

Ib′ycus, a lyric poet of the 6th century, B. C., born in the Greek colony of Rhegium in southern Italy, is best known to moderns from a poem of Schiller, *The Cranes of Ibycus.* Ibycus is known to have been a wandering bard, but Cicero ranks him with so great a poet as Anacreon. The story of his death, according to Schiller's poem, is that, when mortally wounded by robbers, he called upon a flock of cranes to avenge him. This they did, for, when a flock of cranes passed over the theater at Corinth during a performance, one of the assassins who was present involuntarily cried out: "Yonder are the avengers of Ibycus!" Thus the murderers were detected, and the crime avenged.

Ice is water in the solid form. The usual temperature at which water freezes is 32° Fahrenheit. The formation of ice is usually at the surface, owing to the peculiar property water possesses of ceasing to contract when it is within 7.4



AN ICEBERG
(Showing the Proportion Under Water)

of freezing and beginning to expand. This expansion continues until it becomes solid at 32°, which brings the coldest water continually to the surface. Sea water and salt water freeze, but at a lower temperature than pure water. The salt is separated in the process, and the ice, if melted, produces water pure and fresh. The deep-blue of pure ice is best seen in the clefts of glaciers and icebergs. The trade in ice is one of great and increasing importance. It is stored in large quantities, being cut in cakes and packed in sawdust. By a recent invention ice has come to be manufactured. By the machine used 52° of cold are reached; and in India and the tropics, where ice was once never seen, it is now produced in large quantities.

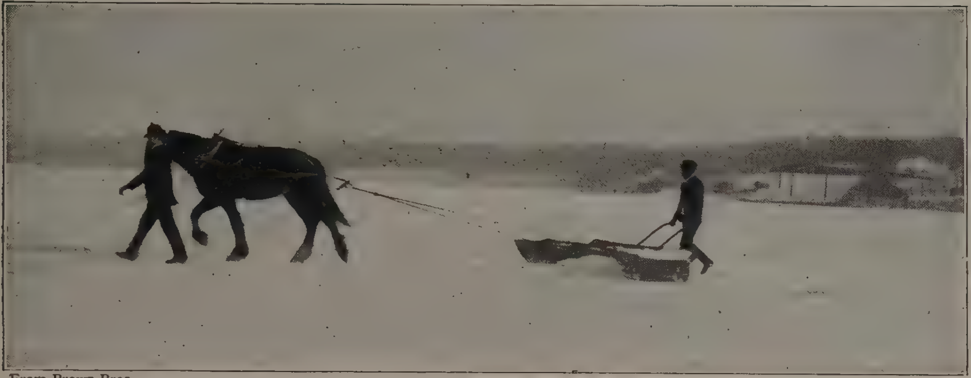
Ice-Age, The. The ice age or glacial period is the time when the northern part of North America as well as much of Europe and Asia, was covered with a sheet of ice, above which rose only the highest mountain peaks. In North America the ice probably was thickest in Labrador, near the western shore of Hudson Bay and in the mountains of British Columbia. From these points the ice seems to have flowed in all directions, but especially southward. For the movement of ice, which is very slow, depends, like the movement of water, upon the slope, not of the bottom, but of the surface, of the ice. The White Mountains were covered, the ice at this point being 6,000 feet thick at least. In southern Connecticut it was 1,000 feet thick. In Norway it was not less than 6,000 feet in depth. Central Europe and the plateau of central Asia were covered, and the ice flowed down the southern slopes of the Himalayas toward the plains of India, reaching within 2,000 feet of sealevel. Some think that the ice age closed as late as 40,000 years ago or even later; but most suppose that it was more remote. It seems that within the ice age there were many glacial periods, between which the area affected became very much warmer. Then the glaciers retreated northward, often blocking up the rivers with broken ice and drift, while the waters from the melted ice covered the land with great lakes. Lake Agassiz, which once covered much of Minnesota and Manitoba, was thus formed. It was 700 miles long from north to south. The last invasion of the glaciers left the thickest deposits of rocks, soil and clay, which the ice had scraped or broken off from the land it passed over or from the sides of the valleys it passed through and carried down to the end of its course. This line of thickest drift, called the great terminal moraine (see GLACIER), passes through Perth Amboy, N. J., near Elmira, N. Y., near Cincinnati, then in an "irregular, sinuous line" through Indiana, Illinois and Iowa and northwesterly through the Dakotas and Montana to Canada.

This ice age is not only wonderful to contemplate; its effects are most important. New England it has covered with broken rocks of all kinds, some of them of enormous size, brought hundreds of miles from where the ice must have broken them off from the bedrock. New York and New England owe to this age the many beautiful lakes which are but river-valleys flooded by the deposits of drift that block their ancient channels. The many falls in the east and west are in most cases due to the same cause; for the old rivers were turned from their old beds which they had worn smooth, and they still have rough paths to follow in the new beds that they then found. In Kansas, Iowa, Minnesota and Dakota are many peatbeds, some of which are due to the floods which prevailed during the warm interglacial periods; while much of the rich soil in those states is due to the great lakes of fresh water that existed then. Less important but interesting signs of the ice age are the kettle holes that abound in the northern states, depressions without drainage, due to the great masses of ice cut off from the glacier, as it retreated, and buried in heaps of deposit. The ice melted and left the hollow that still endures. Then in many places there are surfaces polished by the gritty surface of the ice or grooved by the rocks which the ice carried on in its vice-like grip.

The waves of ice gradually encroaching upon the previously warm regions of the earth must have submitted all living things to many new and disturbing conditions. In consequence many great mammals became extinct at this time; and it is possible that at the same time man assumed those features that separate him so markedly from all other animals.

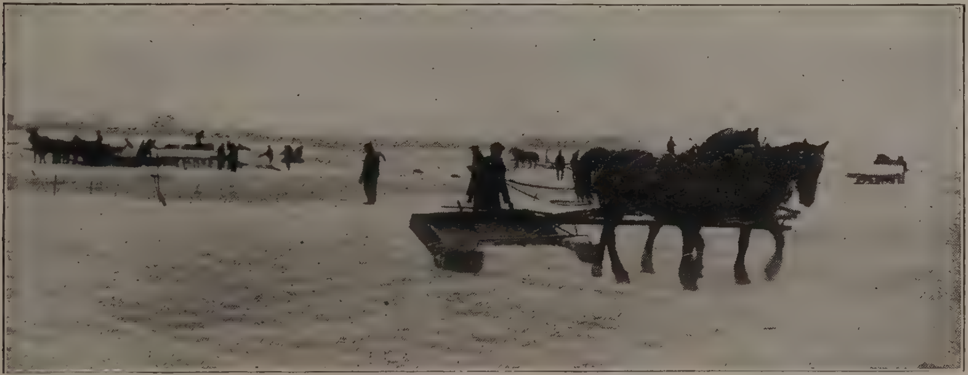
The cause of this wonderful ice age is still unknown. Some say that it was due to the elevation at that time of those parts of the earth where the ice gathered; when the land sank again, the glaciers disappeared. Others attribute it to the fact that sometimes the earth is farthest from the sun in winter time; while thousands of years afterwards it is farthest from the sun in summer. In the former case more ice is supposed to accumulate in the winter than the summer can remove. Thus there are a constant increase of ice and an ice age. In the latter case the ice is removed each summer, and the ice age or glacial period ends. PERCY HUGHES.

Ice'bergs. In the polar regions there are masses of ice covering vast fields and streams during all seasons. When the sun is hottest, huge pieces detach themselves from these icefields and glaciers and float into the open sea. These bergs or moun-



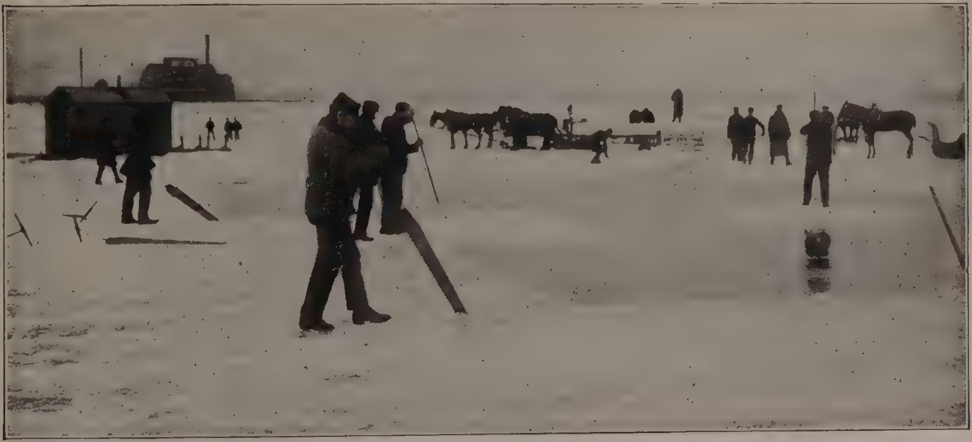
From Brown Bros.

ICE HARVESTING. The snow is first cleared by means of scrapers very much like the scrapers used in building roads or making excavations for the foundations of buildings. It takes two people to do this, one to lead the horse, the other to hold the scraper to its work.



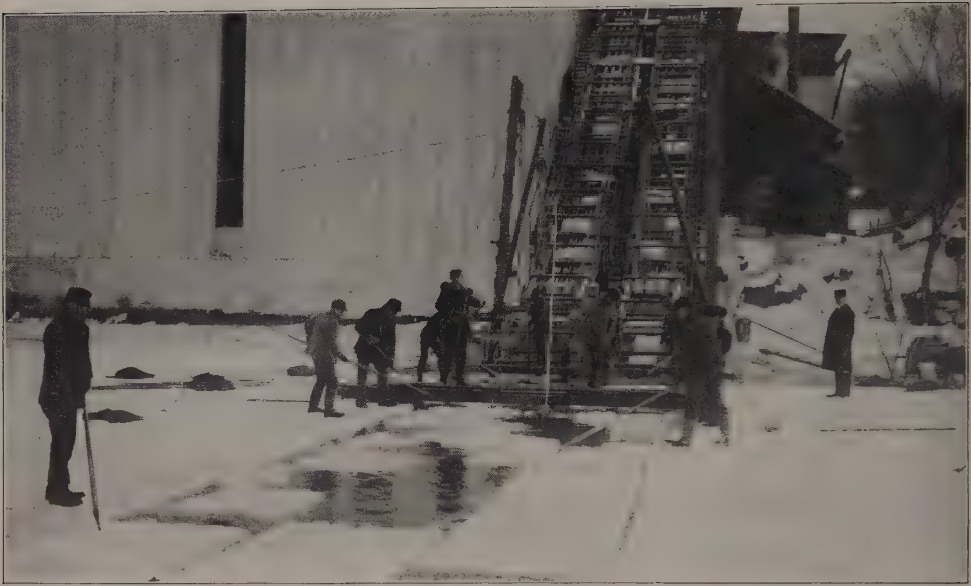
From Brown Bros.

After the snow has been cleared away deep parallel grooves are cut in the ice with what is called an "ice plow." These ice plows are sometimes driven by steam but horses are usually used as you see in the picture. With this plow grooves are cut in the ice in both directions so that the ice is divided into blocks about three feet square. Unless the ice is very thick the plow cuts very nearly through.



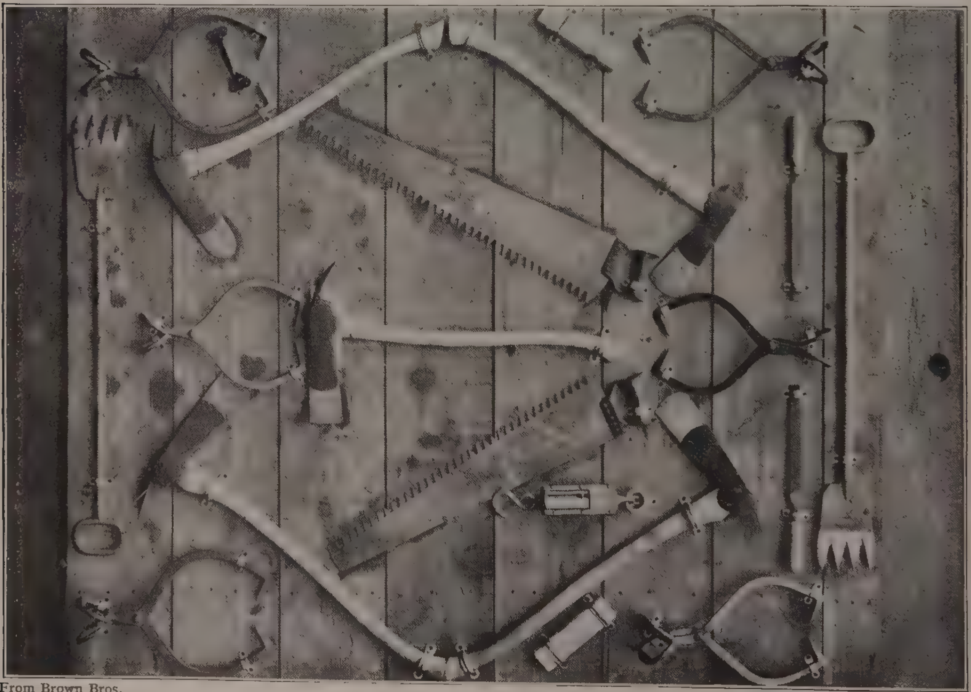
From Brown Bros.

After the ice has been cut nearly through with the plow the rest of the work is done with a saw, one end of which runs down into the water. After the ice cakes are sawed out by one set of men another set pry them apart with crowbars, while a third set floats them down channels, made for the purpose, toward the ice house.



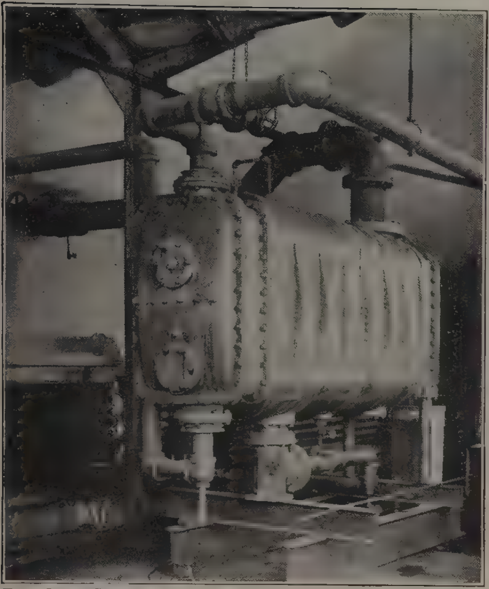
From Brown Bros.

This picture gives a rear view of the ice elevator which you see at the side of the ice house in the first picture. The cakes of ice are floated to the foot of this elevator and carried up into the ice house by an endless chain arrangement similar to the device that carries away the straw and chaff from a threshing machine. At intervals on this chain, which runs over sprocket wheels at the other end, are cleats. The distance between these cleats is a little over the width of a cake of ice. The men at the foot of the elevator push a cake into each section as it comes along. The ice is carried by the elevator up into the warehouse, where it is packed in sawdust.



From Brown Bros.

This picture shows the various tools used by ice harvesters and the men who deliver ice at your door. Here you see various forms of ice tongs, ice shavers, files and stones for sharpening the tools, ice axes and ice scales. Besides these there are augers for drawing off surface waters, forked bars for prying the cakes loose, trimming bars for squaring them, and chisels, adzes and edging tongs used in packing the ice in the warehouse.



From Brown Bros.

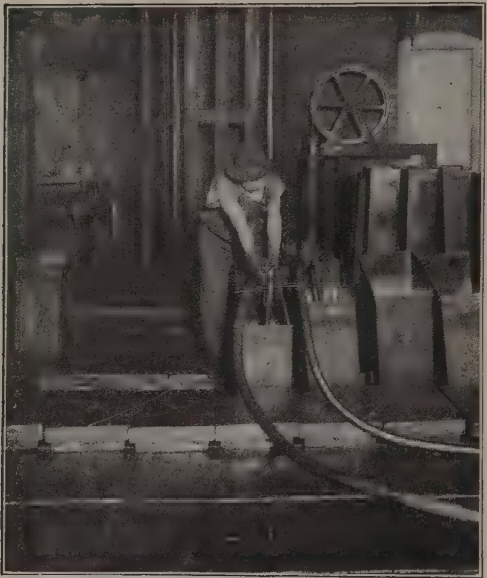
HOW ARTIFICIAL ICE IS MADE. In making artificial ice the first step is to get pure water. The water is boiled and then allowed to stand so that the impurities may settle. After this sediment has settled the water is drawn off and distilled; that is, it is turned into steam and this steam is condensed back into water, as your breath condenses on the window on a cold day. This picture shows a condenser. In the condenser is a series of parallel pipes, inside of which cold water is kept running. The steam to be condensed comes in through one of the large pipes which enter the condenser at the top. The other large pipe supplies the cold water and connects with the coil of smaller pipes inside. As the steam is condensed into water it falls to the bottom of the condenser and passes out through the pipe at the end of the condenser nearest you.

From Brown Bros.

Distilled water is run through several kinds of filters. In this illustration the two large cylinders you see in the rear are charcoal filters. After the water has passed through these cylinders it is pumped through pipes into the kind of filters at which you see these men at work. The men are putting on a fresh filter cloth. Over this cloth is fastened another and coarser filter of perforated metal. Under the cloth is another disk of perforated metal. The water enters by the small pipe in the rear, is forced through the perforated metal and cloth and comes out into the larger pipe you see in front.

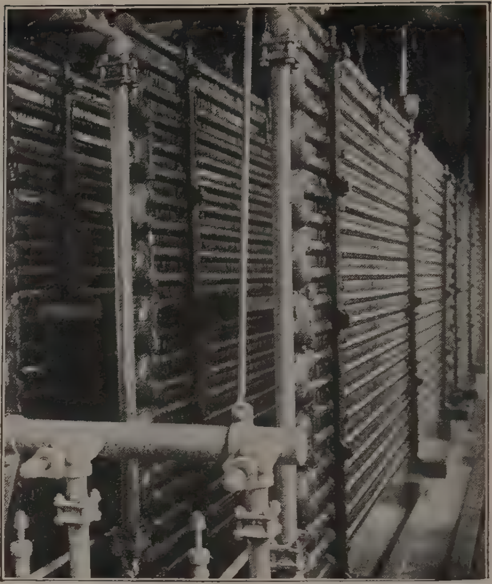
From Brown Bros.

After the water leaves the condenser it is still warm, so it is made to pass through another series of parallel pipes. Over these pipes a spray of cold water is kept playing, which still further cools this distilled water on its way to the filters shown in the next illustration. In making artificial ice the greatest care is taken to secure pure water. Before it is even distilled in the condensing system this water is boiled and then allowed to stand so that the impurities may settle. It is then drawn off from this settling tank, converted into steam and condensed.



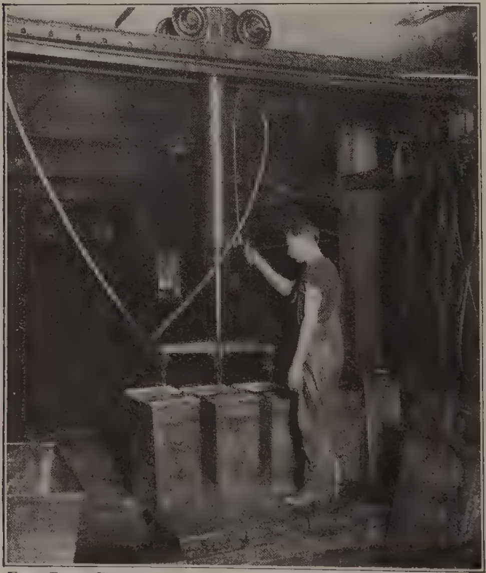
From Brown Bros.

This man is filling the cans with distilled water. It is in these cans the ice is made. On the bottom of the tube you see held in its place in the can with braces is a valve, opening upward. When this valve is pressed against the bottom of the can it lets out enough water to fill the can almost to the top. When the water reaches a certain height it is stopped by a floating check valve. A floating check valve is one which has a hollow metal ball attached so that when the water in which it floats reaches a certain height it turns the valve and either shuts off the water or releases it, as desired.



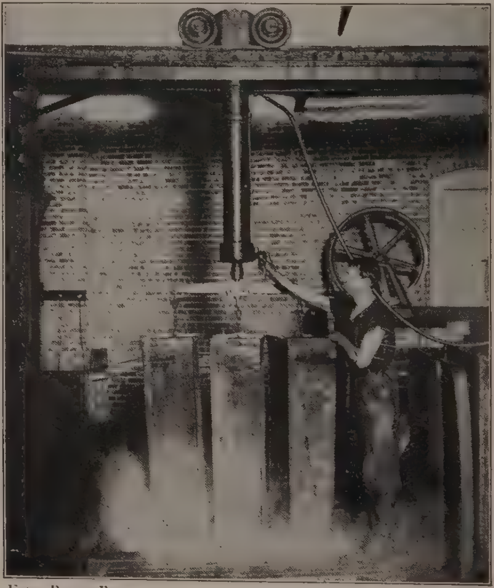
From Brown Bros.

Most artificial ice is made by what is called the compressor system. It is called the compressor system because the ammonia with which the freezing is done is first compressed by means of powerful steam pumps. These pumps then force it through pipes over which cold water is running. This cold water bath still further condenses the gas to a liquid state, which drives out all the heat there is in it. The illustration shows how water is kept playing on the pipes containing the compressed ammonia.



From Brown Bros.

After the ammonia has been condensed to a liquid state, it passes into a great cylinder called an evaporator. Here it begins to expand again back to a gas and passes into parallel pipes like those you have just seen. But these pipes run through a tank filled with brine. When the ammonia is condensed to a liquid form it gives up all its heat, just as water does when it turns to ice. Then, when it is allowed to expand in passing through the pipes in the brine tank, it absorbs the heat from the brine and makes it freezing cold In this brine tank are set the cans of distilled water to be frozen. This illustration shows the cans being lowered into the brine.



From Brown Bros.

After the cans have been lowered into the tank they are covered with wooden slabs that fit down into them. The cans are allowed to remain in the brine until the distilled water becomes a solid block of ice. They are then lifted out by a crane, such as you see this man working with and carried by an overhead trolley to the "thawing off" tank. This tank contains warm water. This man is lowering the cans into this warm water tank. They are allowed to remain just long enough to loosen the ice from the can. After the ice is loosened twenty or more cans are emptied of their ice at the same time and the ice is taken to the store house.

tains of ice sometimes are more than 250 feet above the sealevel, while the volume of ice below sealevel is about nine times that above. At a distance they have the appearance of dazzling white chalk cliffs of the most fantastic shapes. See GLACIERS.

Ice'land, is an island in the northern Atlantic, on the borders of the Arctic Ocean. It lies 130 miles east of Greenland and 850 west of Norway. It belongs to Denmark. Its area is 39,756 square miles. Iceland in many respects is one of the most interesting parts of the world. Its physical features are very remarkable, and not less so its history and the character of its inhabitants. It consists in great part of lofty mountains, many of which are active volcanoes. Only certain level districts along the coasts and a few valleys are inhabitable or in any degree capable of cultivation. There is scarcely a tree to be seen, and the climate is unsuitable for grain. The interior is almost entirely occupied with rugged tracts of naked lava and other volcanic scoriæ. In many places vast ice-fields connect high mountain summits, and prodigious glaciers descend in some parts even to the coast, where they break off into icebergs. To go from one inhabited spot to another is difficult and dangerous, but civilization has long been established. The people are poor but intelligent. Oxen, horses and sheep form the chief part of their wealth. The horses are small, but vigorous and active. Iceland ponies are often imported into Great Britain and the United States. Seals abound on the coasts, and these are taken in large numbers. Various kinds of water-fowl and fish abound, and their flesh is the chief food of the villagers. The mineral wealth of Iceland has just begun to be developed. The population in 1910 reached 85,089. The people are of Scandinavian origin. The legislature, called the *althing*, consists of two houses. The capital is Rejkjavik. The chief exports are Iceland moss, wool, dried fish, sealskins, whale-oil, sulphur, eider-down, birdskins and ponies. There has of late been considerable emigration of Icelanders into Manitoba, Canada. See *Iceland* by Forbes and *Ultima Thule*, by Burton.

Ice-Machin'es and **Ice-Cut'ting Tools.** There are several types and many varying manufactures of ice-making machines, all depending for success upon the principle that cold is produced by the expansion of compressed air, gas or a liquified vapor, as ammonia. The machines most used are those known as ammonia machines because of their use of anhydrous or waterless ammonia. In such machines there is an evaporator or congealer, in which the ammonia is vaporized. This vapor is then compressed by a pump into liquid, the process being aided by a stream of cold water. This part of the process is merely economical, making it possible to use the same ammonia over and over. The ice is manufactured by running the ammonia into coils where it vaporizes. These coils are led into tanks of strong brine. The evaporation in the coils causes intense cold, and the brine is deprived of its heat of made cold in much the same way that water or a room may be heated by pipes or coils carrying steam. That is, they would be made cold instead of warm. of the pipes which carry steam were made to carry this ammonia vapor. Cans of water, set in this chilled brine, are thus frozen. The cans are thus the molds of the ice-blocks that are turned out, and these are of various convenient sizes. The brine is used to surround the cans, because it will still remain liquid under a degree of cold that is sufficient to freeze the water in the cans that are immersed in it. The vaporized ammonia is again gathered and compressed, and again used in producing cold. The pumps, compressors and other machinery of the modern ice-machine are the accessories merely that make practical the industry of producing ice according to the old and well-known law that rapid evaporation produces cold, as does also the sudden release of compressed air or gas. The modern economy known as cold storage is the result of the processes above described, save that the coils to carry ammonia are placed about the sides of large storage rooms and reduce the temperature of the air, as in ice-making they reduce that of the brine in tanks. Ice-cutting tools are such as are used in gathering—"harvesting"—the natural ice in rivers, lakes and pools, so as to store it for summer use. The "planer" is used to clear the ice-surface of snow. It is a one-horse scraper. The "marker" then comes into use to lay out the intended field into cuttings. It is a kind of plow, drawn by a horse, with several shares which cut marks upon the ice. The ice-cutter is a similar machine whose shares cut deeper than those of the marker, and, if the ice is thick, it is run several times in the same cuttings, so that the ice is finally nearly cut through. The cross-cuttings, by which the ice is cut into blocks or slabs, are usually made by hand. Other tools are used to detach the blocks, and seize or push them, while floating, toward the chute or elevator of the ice-house.

Ich'abod Crane, the youth who in Washington Irving's *Legend of Sleepy Hollow* "tarried" in Sleepy Hollow for the purpose of instructing the children in the vicinity, is the hero of the famous adventure with the "headless horseman." He was a type of many schoolmasters of the old school, stern but just, boarding in an itinerant way with the farmers, something of a leader in the singing in church, esteemed by the women folks and altogether "an odd mixture of small shrewdness and simple credulity." The practical joke upon Ichabod which led to his departure from the theater of his courtship and to ignominy, became the foundation of a superstitious legend among the old country-wives.

Ichneumon (*ik-nū'-mon*), a flesh-eating quadruped, having a long, slender body, small head, sharp nose, rounded ears and short legs. The species are numerous, and are natives of Africa and the warmer parts of Asia. They feed on small animals, reptiles, eggs and insects. Once the Egyptian ichneumon was a sacred animal, and with its relative, the mongoose of India, was supposed to destroy serpents and poisonous reptiles. Many wonderful fables are told of its power. The ichneumon is easily tamed, and is useful in keeping the house free from rats and other vermin.

Ichneumon Flies, insects with four membranous wings, that have the habit of laying their eggs in or upon other insects. In this way they destroy many insect pests. All are parasites upon other insects; as a rule, upon those injurious to vegetation. Caterpillars are especially subject to their attacks. The eggs are frequently placed in their little cases upon the skin of insects. After hatching, the larvæ bore their way into the insects and feed upon the blood and juices of their host. The insects thus attacked die, and the small flies come out. The ichneumon family includes minute forms and large ones. The largest one in the United States is an insect of remarkable appearance, with a slender body and three long filaments at its hinder end. The body is about two and one half inches long, and the extreme length from tip of antennæ to tip of filament is ten inches. The middle filament is an ovipositor to aid in laying the eggs. It is armed with a file at the tip. With this instrument the insect bores into trees (see illustration) infested by the larvæ of another insect, viz., the pigeon tremex, which does so much harm to shade-trees. When the burrow of one of these is found, an egg is deposited in it. The larva which hatches creeps along the burrow and attaches itself to the tremex larva, which it destroys by sucking its blood.

ICHNEUMON FLY

I'da, Mount, a high mountain range in Asia Minor, extending from Phrygia through Mysia into Troas. Near its base was the city of Troy. From Ida as their source many famous streams flow, including the Granicus and the Scamander. Mount Ida is celebrated as the scene of many Greek legends. Situated in Crete is another Ida, 8,055 feet high. Here Zeus, the chief god of the Greeks, was said to have been educated.

I'daho, the "Gem of the Mountains" or, from its peculiar shape, the "Panhandle State," is in the extreme northwest of the United States. It is bounded on the north by Canada; on the east by Montana, the crest of the Rocky Mountains and Wyoming; on the south by Utah and Nevada; and on the west by Washington, Oregon and Snake River. Its greatest length, north and south, is 480 miles; east and west, 325 miles. Its total area is 84,600 square miles. The population numbers 325,594.

Surface. The diverse surface makes Idaho scenery more varied than that of any other state in the Union and the peer in sublimity and grandeur of Switzerland. It has lofty mountains, some heavily timbered, some snow-capped the year round; sheer canyons with granite walls; upland meadows with tall grass; extensive plateaus; fertile valleys low foot-hills, suited, in the north of the state, both to summer and winter crops of wheat; lavabeds, the wonder of geologists; opal fields; placid lakes wooded to the very water's edge; large rivers; hot and mineral springs noted and developed for their medicinal properties and used to heat the houses in winter; and falls not surpassed in volume of water and depth by anything but Niagara. A large majority of the surface lies below an elevation of 5,000 feet.

Climate. The varied topography determines the climate, which is extremely diverse in different districts. It is extremely healthful and is noted for the invigorating quality which makes the most efficient work possible throughout the year. The winters, except at great altitudes, are neither severe nor protracted, and the summers are everywhere free from the humidity which makes the middle west and eastern states so trying.

Natural Features. The state has two drainage-systems, the more important emptying into the Pacific and the other into Great Salt Lake. The principal river, the Snake, winds for 850 miles through Idaho, 200 of these miles being navigable. There are about 60 mountain peaks and ranges and 20 lakes.

Towns and Railroads. Idaho's population is distributed through 23 counties. Boise, the capital, has 17,358 inhabitants. Other important towns are Wallace, Lewiston, Coeur d'Alene and Pocatello. There are 11 railroads, the chief being the Great Northern, the Northern Pacific, the Oregon Short Line and the Oregon, Railroad and Navigation Company. The Chicago, Milwaukee and St. Paul will also soon traverse Idaho.

Resources and Industries. Idaho's great resources are its soil, minerals, timber and water-supply. The soil is very productive. The available water-supply, which, by the law of the state must be for public use, is practically unlimited. The Snake River is harnessed at American Falls. The government reclamation service and private individuals are reclaiming vast tracts of arid land in the south of the state by means of irrigation. A dam was erected at Minidoka in 1912 and electrical machinery installed to develop 30,000 horse power. A fine powerplant was erected at Shoshone Falls in 1906. Other plants for lighting cities and for operating street-railways are at Salmon Falls, Horse Shoe Bend on Payette River, Twin Falls and Alberta. Electric rural roads are being constructed throughout the state.

The chief industries are lumbering, mining, stockraising and farming. Its timber is chiefly red fir, white and yellow pine, tamarack and cedar. The Potlatch Lumber Company's mill at Potlatch is second in size to only one other mill in the world and is the largest one in the United States.

The chief minerals are gold, silver, lead, copper, coal, cobalt and building-stone. Idaho has already mined over $300,000,000 in gold alone. The total value of the output in all minerals for 1910 was $15,437,403. The chief crops are cereals, potatoes, prunes, apples, apricots, pears, peaches, timothy and alfalfa. Wheat raised in 1910 was over 12,000,000 bushels. The value of the fruit crop in that year was $2,992,701. Live stock in 1910 was distributed as follows: cattle, 453,000; horses, 197,000; sheep, 3,010,000; hogs, 178,000; pounds of wool sold out of the state, 19,000,000. The new industries, creameries and dairies and the making of sugar from sugar beets, are becoming almost as profitable as sheep-raising and orchardgrowing.

Education. Idaho from the start looked after its educational interests with great foresight and generosity. Its public school system is under the direction of a state board of education and a superintendent of public instruction. The state maintains an academy at Pocatello, Bannock County; the State Normal School at Albion; the Normal School at Lewiston; the Industrial Training School at St. Anthony; the School for the Deaf, Dumb and Blind at Boise; and the State University at Moscow.

The university includes the college of agriculture, the school of arts and sciences, the colleges of civil, electrical and mining engineering and the government experiment station. Excellent administration and magnificent land grants have already placed the university among the leading educational institutions for higher learning in the entire west. The state also maintains the free traveling library system, and has about 110 newspapers and four magazines.

History. Idaho was used only as an emigrant trail to reach the coast until the discovery of gold in the north drew great numbers to Lewiston in 1860. In 1870 Idaho was created a territory. In 1890 it became a state. It is just entering upon a great development. Immigration is largely stimulated by the irrigation projects.

I'dol, an image made to represent a divine being and be adored as such. Worshiping such an object as a god is idolatry. To these images and the objects of nature, as the sun, the moon, the stars, air, water, fire and other elements, divine honors were given by the most ancient nations. Nature-worship or the worship of the various objects in the world around us may be traced to the Phœnicians, who made gods of the sun, moon and stars. The origin of animal worship can be traced to the Egyptians, who made gods of oxen, birds, crocodiles, serpents and still lower forms of animal life. Man-worship had its origin in Greece and Rome, and is familiar to us through their mythology. Among the chief gods of Greece were Zeus (Jove or Jupiter), the god of the sky; Neptune, the ruler of the sea; Apollo, the god of light; Mars, god of war. Idols most often are imitations of the human form in wood or stone, made colossal or monstrous to give added dignity or power. To savage minds the animal is the equal of man; so we sometimes find that their idols were grotesque figures, half-human and half-animal. See *Early History of Mankind* and *Primitive Culture* by E. B. Tylor.

I'dyls of the King. This is the name given by Alfred, Lord Tennyson, to 12 poems published between 1859 and 1872, which tell of King Arthur and his knights. The real Arthur seems to have been a leader of the ancient Britons after the Romans had abandoned the island. It is not certain whether he led them against the heathen Scots or against the heathen Saxon invaders. In any case he was finally defeated. The conquered Britons, who fled to the mountains of Wales and to Brittany in France, began to tell wonderful stories of his valor and goodness, and even fancied that he had not really died but would one day come again to give them victory. Later, the knights of chivalry, because Arthur had been a Christian fighting against heathens, adopted him as one of their heroes and told stories even more wonderful about him; they fancied him a knight like themselves; and around his name there began to center a circle of stories in which many other knights appeared. These were then said to be King

Arthur's knights and members of the circle of the Round Table, where all sat on equal terms under their lord. These stories were written down by Geoffrey of Monmouth (1152) and by Sir Thomas Malory toward the close of the middle ages. Some of these stories praised the valor of the knights more than their goodness; but one class of legends, which told of the Holy Grail, exalted the purity and saintliness of the perfect knight. The Grail was a cup or a stone concerning which many conflicting stories are told; but all agree that it had marvelous properties which it revealed only to those who were perfect in heart and deed. Many sought to be worthy of it; but few attained that goal.

We have to understand how the stories of King Arthur came down to us, if we would understand Tennyson's treatment of the subject. He might have restored the memory of that ancient chief, "the gray king," whose name still is given to many a hill and ruin in Great Britain; or he might have gloried in the strength and the passion for adventure of all sorts which to the medieval knights seemed the best things in Arthur and his knights. Again, he might have sung of the Holy Grail, above all, and have exalted Arthur's saintliness. Other poets in England and Germany, Spenser, Swinburne and Wagner have done one or other of these. But Tennyson chose the noblest view of Arthur's character, and makes him the king who fought against brutality and misery in all their forms (compare Lowell's *Vision of Sir Launfal*). Hence it is that he calls these poems idyls; for an idyl now means a narrative poem, not so long or severe as an epic, less emotional than a lyric, elegant and exalted in style and plan, inspired by high and noble sentiment.

These 12 idyls form a unity. The first, the dedication to Prince Albert, the Consort of Queen Victoria, who had just died in 1861, sounds the keynote. The second tells of Arthur's birth, his winning the crown of Britain, his marriage to Guinevere and the solemn formation of the Table Round. Then follow four tales, the adventures of Gareth, Geraint and Launcelot and the misadventure of Merlin the magician. In each of these poems we see how men got from their king the stamp of nobility of soul; but in each successive poem we see more clearly the spiritual weakness of Arthur's followers, which must finally destroy his great work. In the seventh poem we perhaps reach the climax of the idyls; for here Galahad, the one knight worthy of Arthur, leaves his king and the world of action to pursue the sacred and wonderful Grail. And many of the best knights follow him; though for them the search must be in vain. The eighth and ninth idyls deepen the shadows. The valor of the great Tristram wins him the prize of the tournament; but his treacherous lust brings him death. The tenth idyl tells the flight of Arthur's unworthy queen, Guinevere, and the breaking up of the Round Table. This is the saddest and most beautiful of the poems. Then Arthur, fighting his rebellious vassals, wins victory at the cost of life — for he dies to the world, being carried away to the island valley of Avilion, "where I will heal me of my grievous wound." The twelfth is the address to the queen, in which Tennyson explains his purpose in writing the poem.

We can see in what sense Tennyson would suggest that Arthur is not really dead. For has he not returned, healed indeed of his wound, in these very poems of Tennyson and in the ideal which is held up to men in Arthur's name? If we remember that to us our country is "the king," the vows to which Arthur bound his knights are not unworthy of our earnest consideration:

"But I was first of all the kings that drew
The knighthood-errant of this realm and all
The realms together under me their head,
In that fair order of my Table Round,
A glorious company, the flower of men,
To serve as model for the mighty world
And be the fair beginning of a time.
I made them lay their hands in mine and swear
To reverence the king as if he were
Their conscience, and their conscience as their king.
To break the heathen and uphold the Christ,
To ride abroad redressing human wrongs,
To speak no slander, no, nor listen to it,
To lead sweet lives in purest chastity,
To love one maiden only, cleave to her,
And worship her by years of noble deeds,
Until they won her."

Ignatius (*ĭg-nā'shĭ-us*), **Saint,** was bishop of Antioch about 69 A. D. He was said to have been a disciple of St. John. His surname was Theophorus, which means "one who carries God." There is a legend that he was the little child whom Jesus set in the midst of his disciples when he taught them the lesson of humility. All that is known with certainty about him is found in his letters to the churches, of which there are 12, called the Ignatian Epistles, though only a part are believed to be genuine . These letters were written on his journey to Rome, whither he had been sent to meet death by wild beasts, to which he had been condemned at Antioch. His martyrdom at Rome took place about 110 A. D. See *Apostolic Fathers* by Lightfoot.

Ignis Fatuus (*ĭg'nĭs făt'ū-ŭs*), a Latin term meaning vain or foolish fire. It presents the appearance of bright spots, usually found in marshy places and over stagnant pools. It is seen a little after sunset, like a pale, bluish flame, varying in size and shape; sometimes it shines steadily until morning, at other times disappears and reappears each half-hour. Observers have described it as a flame floating in the air, either close to the ground or a few feet above it. It is often seen as a fixed flame shining steadily, and at other times as a light in motion, bounding over the country. Its appearance is most common in the north of Germany, in the marshes of England and in the lowlands of Scotland. The cause of the strange light has been supposed to be the burning of the gassy vapor which arises from decaying vegetable matter, but this cannot be so, as this gas does not burn unless set on fire. Popular names for it are Will-o'-the-wisp and Jack-o'-lantern

Igorro'tes, a race of warlike Filipinos, largely of the Malayan type, are chiefly confined to the island of Luzon. They show traces of Mongolian blood, due to the long-continued rule of the Chinese. They are to be distinguished from the black and dwarfish Negritos.

Illimani (*ēl'yē-mä'nē*), one of the principal mountains of the Bolivian Andes. It is 40 miles southeast of La Paz and is 21,150 feet in height.

Illinois (*il-i-noiz'* or *-noi'*), one of the central states of the United States, contains 56,650 square miles. It is 378 miles long and 210 wide. The state is divided into 102 counties, with the capital at Springfield, near its center. The chief cities are Chicago, Peoria, Quincy, East St. Louis, Springfield, Rockford and Joliet. The state is bounded by Wisconsin on the north and by Lake Michigan and Indiana on the east, and is separated by the Ohio from Kentucky on the south and by the Mississippi from Iowa and Missouri on the west.

Surface. The Prairie State, as Illinois is called, is in the main level. Unlike the great plains of the west, however, it is rolling, with sloping hills and broad, shallow valleys. The highest part of the state is in the northwest, where there are some high hills. The southern part of the state is crossed by another line of hills, from the Ohio to the Mississippi. This is a spur of the Ozark Mountains. The central part of the state is a broad valley, extending in a southwesterly direction almost across the state. A low ridge of land, stretching across the northeast corner, separates this central valley from Lake Michigan. This divide, which prevented the lake from flowing into the upper streams of the Illinois, has been cut through, and this cut forms the Chicago Drainage Canal, which see.

Drainage. Nearly three fourths of the boundary of Illinois is formed by navigable rivers. The main rivers of the interior have a southwesterly direction. They are the Rock, Illinois (500 miles long) and the Kaskaskia, which flow into the Mississippi.

Soil and Climate. The fertility of Illinois is such as to make it one of the finest farming states in the Union. It has few hills or mountains, being mainly rich prairies, while the river-bottoms, with a vegetable soil 40 feet in depth, have produced crops for many successive years without fertilizing. The extreme southern part of the state is warm, with mild winters, but the northern part has a severe climate. Sudden changes of temperature are frequent, and extremes of heat and cold are great.

Products and Natural Resoucres. The chief cereal crops are corn, wheat and oats, but barley, rye and buckwheat are also grown. Potatoes, hay and tobacco, apples, pears, peaches, grapes etc. also are among its products. The state has a large stock industry, comprising cattle, horses, swine and mules. It is rich in minerals, having nearly one fifth of the coal-field area of the United States, which covers about three-fourths of the state, with 800 mines. Iron ore, zinc, lead and copper are found, also petroleum, natural gas, fluor-spar and limestone.

Education. The state has done and is doing great things for education, which is free and compulsory for children between seven and 14 years of age. General supervision of the public schools is entrusted to the superintendent of public instruction. Each county has a superintendent, who examines accounts, inspects schools, and grants teachers' certificates. Among the prominent educational institutions of Illinois are the Chicago University, with 334 instructors, St. Ignatius College (R. C.); Northwestern University, with 195 instructors; Lake Forest College, with 18 instructors; Knox College at Galesburg, with 32 instructors; Illinois Wesleyan University, at Bloomington, with 22 instructors; Armour Institute of Technology, at Chicago, with 68 instructors; and at Peoria, Bradley Polytechnic. Illinois has normal schools at Normal, De Kalb, Charleston, Carbondale, Macomb and Chicago; and located at Urbana is the state university, with 609 instructors. The state university has an agricultural department and an experimental station connected with it, and in 1862 received from congress a land-grant of 480,000 acres. Other institutions are Illinois College, Shurtleff College, McCormick, Union Baptist and Chicago Theological Seminaries.

Manufactures. Having natural advantages in its water communication by lake and rivers, abundance of coal and, in addition, many thousand miles of railway, Illinois has become a great manufacturing state. Her chief industries are slaughtering and meat packing, the manufacture of iron and steel, foundry and machine-shop products, furniture, agricultural implements, clothing, liquors, printing and publishing, electrical machinery and railway cars.

Railroads and Population. Illinois ranks as second state in the mileage of railroads.

The population has increased rapidly from 12,282 in 1810 to 5,638,591 in 1910, placing it third among the states. More than half the people were born in other states or foreign countries.

The arsenal at Rock Island was established by congress in 1863, and is the best equipped arsenal in the United States, with powder works and foundries. When in full operation it can arm, equip and supply 750,000 troops. Fort Sheridan, on Lake Michigan, 25 miles north of Chicago, was built by the government in 1888, and beyond, at North Chicago, is the U. S. Naval Training Station. At Springfield is the grave of Abraham Lincoln.

History The first Europeans to see Illinois were Marquette and Joliet in 1673. Joliet, La Salle and Tonti visted the region again in 1679, and in 1680 La Salle and Hennepin established Christian missions there. The first American settlers were from Virginia, which claimed the whole of the northwest, but generously yielded its claim to the United States in 1784, when Illinois became United States territory. It was organized as a territory, including Wisconsin, Minnesota and Michigan, in 1809. In 1818 it was admitted into the Union. It suffered from the Black Hawk wars in 1832; and in 1840 by an uprising of the people, when the Mormons, who had founded the town of Nauvoo, were driven out. See *Early History of Illinois* by Breese; *Illinois, Historical and Statistical*, by J. Moses: and *Illinois in the Black Hawk and Mexican Wars* by Elliott.

Illinois Indians, the name of a community of tribes of Indians related to the great Dakota family, which inhabited the territory now comprised in the state of Illinois and also tracts of land west of the Mississippi River. They principally were Algonquins. History tells us that they were a brave, warlike race, who aided the French in their Indian wars, and fought the Sacs and Foxes on their own account. There still is a small part of the tribe on a reservation in Indian Territory.

Illinois River is the largest river in the state of Illinois. It is formed by a union of the Des Plaines from Wisconsin and the Kankakee from Indiana, and flows nearly 500 miles before reaching the Mississippi. It is navigable for 245 miles from its mouth. The chief branches are the Fox and Spoon Rivers on the north and the Vermilion, Mackinaw and Sangamon Rivers on the south and east. It is now connected with Lake Michigan through the Chicago Drainage Canal. It is proposed to open a deep-waterway through this canal and the Illinois and Mississippi Rivers, from the lakes to the Gulf, and thus to the Panama Canal.

Iloilo (*ē'lō-ē'lō*), a coast town, capital of the province of the same name, on the southeast coast of the island of Panay. Philippine Islands. It was, until the American occupation, one of the three ports at which foreign vessels might make entry and take cargo. The harbor is safe but shallow, so that vessels must load and discharge by means of lighters. The population is estimated to be between 12,000 and 20,000. After the cession of the Philippines to the United States, the Spaniards surrendered Iloilo to the Filipinos who were besieging it. The place was soon captured, however, by the United States forces.

Imag'ina'tion. This term is ordinarily used to indicate creative power of the mind. Psychologists commonly employ it in a somewhat more limited sense to mean the reproduction, in more or less original combinations, of the impressions received from the senses. They distinguish imagination from memory proper or memory in the narrow or technical sense of the term, in that the latter involves in addition to images a consciousness that these represent some specific experience in one's own past life. We can imagine the North Pole, but memories are possible only of places where we have been. Imagination is usually classified as reproductive or productive, according to whether its content is simply a reproduction of a past experience or a new construction. It is probable that these types differ in degree of originality rather than in kind. All images usually differ from the impressions that they reproduce in definiteness, vividness and feeling of reality. They also commonly involve some difference in the arrangement of the colors, sounds, forms or objects presented. When these differences become so great that we seem to have an entirely new concrete situation presented, we say that we have productive or creative imagination. The materials of creative imagination, as colors, forms, sounds, tastes, odors etc. are, however, all derived from sense-experience. One born deaf cannot in the psychological sense imagine sound. He might try to do so, but his image would be based on those sensations that he himself is capable of getting. Men differ very much not only in vigor but also in kind of imagination. (See MEMORIZING). Some image sights especially well, others sounds, others again touches, tastes, odors or motor-sensations. A good, all-around imagination often occurs. The value of imagination, especially of sights or sounds, is great. It enriches the mental life, making it more complex, resourceful and interesting. The practical use of this lies in that, when new situations are presented with which the habits of the individual are unable to cope, imagination comes to the rescue with alternatives. A farmer with imagination, when one crop fails, thinks of the possibility of raising others or of different uses for his land. An imaginative mechanic is not at a loss when his machine breaks down Imagination calls up other experiences than the habitual ones, getting from them suggestions that may prove fruitful when the routine ways of acting fail. Thus it constitutes the proper reaction of a resourceful mind in the case of a crisis. When the images are very definite and vivid, and especially when we recall in memory the experience from which they sprang, we gain the additional advantage of being able to judge more accurately the probable success of the line of action suggested by imagination. A milliner who can clearly picture the hat that her imagination suggests, or remembers similar hats, is helped in anticipating whether or not her creation will prove a success.

Imagination is governed by the laws of association of ideas (*q. v.*). Its cultivation, therefore, depends on enriching the experience of the child and, especially, on increasing the associations by virtue of which these experiences will be recalled when needed. Modern methods of teaching (*q.v.*), aim especially at such associations and also at developing the self-reliance and resourcefulness of the child. As imagination is the original,the experimental, factor in the mind, so too close an insistence that its products shall conform to truth or taste or practical excellence may check its spontaneity and leave the pupil critical but not productive. See ASSOCIATION OF IDEAS, MEMORIZING and TEACHING, METHOD OF. Consult Ribot's *Essay on the Creative Imagination.* (Open Court Pub. Co.)

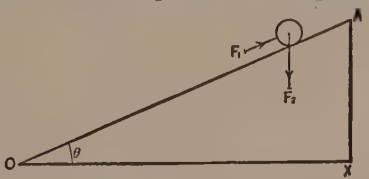
Im'migra'tion Bu'reau. This is one of the offices under the Department of Commerce in the U. S., although the Commissioner-General of Immigration is placed by the act of 1903 under the control of the Secretary of the Treasury. The act of 1903 gives the bureau of immigration the power to deport certain classes of immigrants at any time within two years of the date of landing in America. Such classes include insane persons, if they were in this condition within the five years previous to their arrival, anarchists, any who advocate political assassinations and epileptics. The bureau publishes valuable annual reports. In 1910 no less than a million immigrants came into the United States, chiefly by way of New York.

Im'mortelles' or **Everlasting Flower,** a kind of plant whose flowers do not change in color or appearance in drying. They may be kept for years without losing their beauty. Several kinds of everlasting flowers are frequently seen in our gardens and others in greenhouses. The French call them *immortelles*, and in France they are often woven into wreaths and placed beside recent graves as emblems of immortality.

Impeach'ment is the name applied in England and the United States to a special form of trial, by which high state-officials can be called to account for their manner of managing the interests committed to them. In England the house of commons presents the charges and prosecutes the case. The house of lords acts as judge, and the accused may be defended by counsel. In the United States the house of representatives makes the accusation; the senate, with the chief-justice of the supreme court presiding, acts as judge. The trials are for "treason, bribery or other misdemeanors." In the various states the legislatures can also bring an action before the state senate against any state officer. In England members of parliament can be impeached; but in the United States only the civil officers of the government are subject to trial. The most noted cases of impeachment are those of Judge Samuel Chase in 1804 and President Johnson in 1868 in the United States. and in England that of Warren Hastings.

In'cense, a perfume much used by the ancients in their religious worship. It was produced by burning sweet-smelling substances, like gums, balsams etc. The material, generally a mixture of several kinds of gum, is placed in a dish called the censer, in which it falls slowly on to a hot plate beneath, when it immediately burns and spreads its odor through the air. Among the Jews the burning of incense was employed only as an act of worship, and was in itself thought to be a sacred offering. The same was also true of the religion of Egypt. Persian sculpture pictures the burning of incense in honor of kings. In the Catholic Church, both Greek and Roman, incense is used in public worship, especially in its most sacred services.

Inclined' Plane, a device frequently employed to avoid the direct lifting of heavy bodies. Barrels are frequently loaded into wagons by use of "skids," which are simply inclined planes. Goods are often taken aboard steamers by means of inclined gangways. By the principle of the conservation of energy we know that the work required to raise a mass to a certain height above the ground is independent of the path by which it is raised, *provided* we neglect friction. Let F_1 be the force required to push the body along the incline O A in fig. 1, and let F_2 be the weight of the body. If the length of the slope O A be X_1 and the



THE INCLINED PLANE

vertical height X A be X_2 then by the conservation of energy $F_2\ X_2 = F_1\ X_1$

$$\text{or}\quad {}^{F_2}/_{F_1}\qquad {}^{X_1}/_{X_2} = \frac{1}{\sin\theta}$$

where θ=angle A O X which measures the steepness of the inclined plane. The mechanical advantage of the inclined plane is, therefore, $^1/\sin\theta$. This statement is sometimes called the law of the inclined plane.

In'come Tax. The U. S. Tariff (*q. v.*) of 1913 imposes a tax of from 1% ("normal") to 6% ("additional") payable to internal revenue collector for each district, on incomes above $3,000, rate increasing with income up to $500,000. Exact interpretation of the law, as in the case of other laws, will depend to some extent on individual circumstances which differ greatly, but the following analysis will enable anyone to answer the great majority of important questions that arise:

Married couples are entitled to an aggregate exemption of $4,000. The other exemptions are: Salaries of president, federal judges and employes of states and political divisions thereof; stock dividends, as these have already paid the Corporation tax; interest on obligations of the U. S., or political subdivisions thereof; proceeds of life insurance policies.

Net profits are determined in the usual way, by deducting expenses, other than living expenses, bad debts and other losses. The customary deduction for depreciation of property, stock, etc., in each line of business, is also allowed.

On incomes above $20,000 and not exceeding $50,000 the "additional" tax is 1% and so up to incomes of $500,000 and above.

Example. A tax on bachelor's income of $600,000 (limitations within which additional taxes are levied are shown in parentheses):

Normal Tax (1%) on $600,000 (less $3,000).....	$ 5,970
$30,000 ($20,000 to $50,000) at 1% additional...	300
$25,000 ($50,000 to $75,000) at 2% additional...	500
$25,000 ($75,000 to $100,000) at 3% additional..	750
$150,000 ($100,000) to $250,000) at 4% additional	6,000
$250,000 ($250,000 to $500,000) at 5% additional	12,000
$100,000 (income above $500) at 6% additional..	6,000
Total tax..................................	$32,020

Returns (written and sworn) giving gross income and exemptions must be made between January 1 and March 1 for preceding calendar year on forms furnished on application by collector. Banks also usually furnish forms to depositors. Only persons having taxable incomes are required to make returns except as indicated in next two paragraphs.

Tenants and all other persons or organizations paying salaries, rent, interest or other forms of income of individuals in excess of $3,000 (except proceeds from life insurance contracts other than annual interest payments) must withhold "normal" tax (1%) and turn it over to the government *unless landlord or other payee files sworn statement with tenant or other payer that his income, or any part of it, is exempt.* Payer must make return showing portion of income of each person from which the "normal" tax has been thus withheld.

Incomes from bonds and similar corporate obligations regardless of amount, must be withheld at source unless payee attaches exemption certificate. "Normal" taxes *only* are collected "at source;" "additional" taxes from person who receives the income. Incomes irregular in amount (as those of commission agents, farmers, merchants and from fees) are not taxable "at source."

Penalties. For false statements, failure to return or to pay taxes by times specified heavy penalties are provided.

Japan, England, Germany, Holland, Italy, Austria, Denmark, Switzerland, Australia and New Zealand have income tax laws.

In'dia. a large region of southern Asia, probably the most populous country in the world. It has long been celebrated for its riches and valuable natural products. Its people were early civilized, and exhibit remarkable taste and skill in the manufacture of the most costly merchandise. India proper, the central peninsula of southern Asia, is about 1,900 miles long and 1,600 wide, covering 1,766,642 square miles. The British provinces occupy 1,097,901 square miles, while 691,253 square miles are taken up by the feudatory or native states. The population, in 1911, of the British area was 244,267,542, and of the native states, 70,864,995, or a total for all of 315,132,531. The chief occupation of the people is agriculture, which employs about 192 million people. The principal towns (including cantonments), with their populations, in 1911 were Calcutta (with suburbs), 1,222,300; Bombay (979,443); Madras (518,660); Haiderabad (500,623); Lucknow (259,798); Rangoon (293,316); Benares (203,804); Delhi (232,837); Lahore (228,687); Cawnpore (178,557); and Agra (185,449).

Surface. Its physical features are so varied and interesting, that its surface has been called "an epitome of the whole earth." There are lofty mountains, covered with perpetual snow; broad and fertile plains, bathed in tropical sunshine; arid wastes and impenetrable forests. Its great natural divisions are the sub-Himalayan countries, the plain of the Ganges, the plain of the Indus, the highlands of northern Hindustan and the southern peninsular portion. The mountain system forms a connected whole. The Himalayan (meaning the abode of snow) consists of a chain some 1,500 miles in length, in which the peaks rise often from 20,000 to 30,000 feet above the sea, covered always with a snowy crown.

Drainage and Climate. The rivers are the Indus in the northwest, with a course of 900 miles; after starting from the Himalayas and draining, with its tributaries, 300,000 square miles it empties into the Arabian Sea; in the northeast is the Granges, with the Jumna and other streams, which form part of the Bengal delta and drain about 500,000 square miles. Other large rivers drain the central region. The country as a whole has three well-marked seasons — the cool, the hot and the rainy. The rainy season falls in the middle of summer, the moist, hot months following. The winter is the pleasant period of the year. The central tableland is cool, dry and healthy.

Animals. The animals domesticated are first the cattle — cows, buffaloes and oxen; the last two do the work of agriculture. The bull and cow are sacred animals to the Hindus, and are never killed for food. The pony, donkey and mule are largely used. Sheep and goats are abundant. The monkeys are tame, and are also held sacred. Of wild beasts the most feared is the Bengal tiger. The other beasts of prey are leopards, wolves, jackals, panthers, bears, hyenas, lynxes and foxes. The elephant is used for purposes of war and state. Many poisonous snakes abound, the most dreaded being the cobra.

Occupation. Only one third of the whole country is available for farming, yet two thirds of the people are engaged in agriculture, and this is why terrible famines, such as that of 1900, occur when there is failure in the crops through lack of rain.

Vegetation. The vegetation is as varied as the climate and the soil, passing from the vegetation of a tropical to that of an alpine region. Rice is the chief article of food, and is produced in all districts where irrigation is practiced. Wheat is grown in the Ganges valley, the Punjab and the central provinces; sugarcane in Agra, Bengal, the Ganges valley and the Punjab; tea in Assam and Bengal; cotton in the northwest provinces, Bombay, Madras and Berar; indigo in Bengal, Agra, the Ganges valley and Madras; and tobacco in Bengal and Madras. Opium is one of the most valuable products. The cultivation of opium is a government monopoly, and it is chiefly exported to China. The mango, the peepul, the orange, the banyan and the teak are found among the trees.

Commerce. The United Kingdom enjoys almost a monopoly of the trade, using nearly all the tea raised and the products of the thousand factories belonging to the state. There has of late been a rapid development of the coal-trade, though, owing to the famine, there have been serious diminutions in the volume and value of the export trade. Four fifths of this trade is with Great Britain, carried through the Suez Canal. About 32,099 miles of railroads are in operation, which in one year carried 371,576,000 people. There are 72,746 miles of telegraph lines, and 64,395 post-offices, with good roads and a large traffic by boats on the numerous rivers. The canal systems, which are used mainly for irrigation, are the most extensive in the world.

Education. There are five universities, at Calcutta, Bombay, Madras, the Punjab and Allahábad, with many affiliated colleges; while there are a number of engineering and technical schools and about 135,000 other institutions. These numbers do not include the schools established by the missionaries of different churches, which are very numerous. Only about four per cent. of the people, however, can read or write.

Government. Politically, India is a dependency of Great Britain, consisting partly of territory under the direct administration of British officials, and partly of native states subordinate to the suzerain power. The supreme executive authority is vested in the governor-general in council or viceroy, as he is called, but in England every measure concerning India runs in the name of the secretary of state for India, and he alone is responsible to parliament. For purposes of administration India is divided into the following great divisions, the seat of supreme government being Delhi: the presidencies of Bombay and Madras, each ruled by a governor appointed by the crown, with executive and legislative councils; Bengal; the Northwest Provinces; the Punjab; and Burma — each under a lieutenant-governor and each having a legislative council; the Central Provinces; Assam; and British Beluchistan — all under chief commissioners. Besides the presidencies and provinces under direct British administration, there are a number of feudatory or native states more or less under the control of the Anglo-Indian government. The established strength of the British army in India is over 74,000 men, the native army being about twice as large.

Religion. The population is made up of about fifty native tribes, which can all be traced back to two or three original races. The Hindus, who form three fourths of the people, are strictly those who accept the Hindu religion or Brahmanism, now commonly called Hinduism. This is the great religion of India, Buddhism and Mohammedanism also prevailing. Brahmanism dates back to about 1200 B. C., and its sacred books are called the Vedas and are among the oldest literary documents known. They mainly are collections of hymns. Brahmanism originally was a philosophical religion, mingled with the worship of the powers of nature — Brahma, for example, was represented with four heads, to indicate the four quarters of the globe — but in practice, in the course of centuries, the religion became a system of idolatry, with cruel rites and hideous images. The caste system, a part of the religion, was a grievous burden; the Brahman caste, including the priests, was the highest; then came the warrior caste and the trades caste, the lower classes following. The Mohammedan religion has about 67,000,000 followers in India, and Buddhism has about 10,700,000. The other chief religious sects are the Parsis, Sikhs and Jains. Christianity was introduced in the third and eighth centuries, but received its greatest impetus when St. Francis Xavier reached there in 1542. Modern missions began in India early in the 18th century, and the native Christians now number 3,876,196.

History. In the early history of India we have the Aryan invasion, about 1000 B. C. or earlier, bringing in the Sanskrit language and the Vedic religion; the Persian invasion under Darius (518 B. C.); and the Grecian under Alexander the Great (327 B. C.). In 1001 A. D. the Mohammedans overran almost the whole country. The Mongol invasions under Genghis Khan and Tamerlane ended in the Mogul empire (1525), Akbar the Great being perhaps the greatest sovereign India has ever known. The empire divided after his death in 1707. The European nations appeared first in India as travelers, traders and missionaries, the Portuguese, the Dutch and the French having settlements early in the 18th century. The British East India Company settled in India in 1653, with three trading-settlements at Calcutta, Madras and Bombay, Its power dates from the battle of Plassy in 1757, won by Clive over the Mogul, which gave England the dominion of Bengal. The company was chartered by England, and had to be sustained by English troops, and with every renewal of the charter the government assumed more control. The annexation of territory continued without check, except in 1838, when the effort to establish a British protectorate in Afghanistan was a failure, and in 1857 occurred the Indian mutiny, with its massacres of English residents at Cawnpore and other places. In 1858 the government passed into the hands of Great Britain, and the British East India Company ceased to exist, The wars of 1878 and 1884 with Afghanistan and Burma have increased and strengthened British territory. See *Modern India* by Monier Williams; *India in* 1880 by Temple; *Asiatic Studies* by Lyall; and *History of India* by Grant, by Duff, by Mallison and by Kaye.

India-Rub'ber or **Gum Elas'tic** is a substance found in the milky juice of certain plants in tropical and subtropical countries. The principal tree from which it is obtained is tall and graceful. Its appearance is well-known, and the glossy leaves have been seen on small trees grown in pots as ornamental plants. Some of the properties of india-rubber must have been known in America at a very early period, for it is related by travelers as early as Columbus' second voyage that the Haitians made balls of the "gum of a tree," which bounced better than the wind-balls of Spain. India-rubber was first imported for rubbing out from paper marks made with black lead (1770), whence its name. In 1820 it began to be used in the many useful ways in which we find it to-day. It is gathered by making cuts in the trunks of the trees. In a few hours the juice fills the clay basins placed to receive it. A good tree will yield four ounces of juice daily and twenty gallons in a season. A gallon will produce two pounds of good rubber. It is made solid by drying in the sun or in other ways. To purify the raw material, it is boiled and pressed through powerful machines, rolled out into thin plates and then dried the second time. One pound of rubber will make 32,000 yards of thread. Pure rubber is very little used now, but in its vulcanized state the uses to which it is put are innumerable. The process of vulcanizing rubber, which has made it available for many purposes, was discovered by Goodyear (*q. v.*), and consists in heating the pure rubber with sulphur, which hardens it. It is used in making shoes, cloth, belting, tires, hose, washers, tobacco-pouches, combs, chains, bracelets, paper-knives, furniture, rails and paving. There have been many efforts to obtain a substitute for India-rubber, as the raw material is expensive, but so far without success.

In'dian'a, one of the central states of the Union, is the smallest of the western states, being 275 miles long, with a breadth of 140, covering an area of 36,350 square miles. Its population is 2,700,876. The state is bounded by Michigan and Lake Michigan on the north; by Ohio on the east; by Illinois on the west; and by Kentucky, separated by the Ohio River, on the south. The state is divided into 92 counties, with the capital, Indianapolis (pop. 233,650), near its center. The other chief cities are Evansville, Fort Wayne, South Bend and Terre Haute.

Surface and Drainage. The surface is level, generally speaking, with sluggish streams. The northern part originally was swampy, but since its drainage the soil is wonderfully fertile and the climate healthful. The central portion is somewhat rolling, and the southern part slightly hilly. Its southern portion is drained by the Ohio and its tributaries. The Wabash River, which forms its western boundary for 100 miles, crosses the state. It is 600 miles long and navigable for 300 miles. These are the main streams, but in the northwest is the Kankakee, draining into the Illinois, and in the northeast are the St. Joseph and St. Mary's Rivers, which unite at Fort Wayne and become the Maumee.

Natural Resources. Coal, iron ore, sandstone, gypsum and natural gas are among its mineral riches. The coal product in 1910 was 18,389,879 tons; that of petroleum was about 1,568,475 barrels. There was a decrease in the volume of natural gas and petroleum. Indiana was originally covered with heavy forests, and its lumber-product still reaches $16,000,000 yearly.

Agriculture. Farming is an important industry. The Wabash valley is one of the most fertile regions in the world, and the yield of wheat and corn is enormous. The staple productions are wheat, corn, barley, rye, potatoes and tobacco. Many horses, sheep, cattle and hogs are raised.

Manufactures. Indiana has become an important manufacturing state. In the northwest portion are such manufacturing cities as Hammond and Gary, which are contiguous to Chicago, and Michigan City is in the northwest. The principal manufactures are steel, iron, carriages, wagons, plate-glass, plows, railroad cars, office-desks and machinery. Other important industries are flour and gristmilling, slaughtering and packing, clayworking and brewing.

Education. Indiana ranks high in the educational world, having always given much attention to schoolwork and making wise provision for support of schools. Each county has its superintendent, and these are under the supervision of a state superintendent. Indiana in 1912 had a school population of 761,494, the number of schoolhouses in the state being 9,197 and of teachers 17,305. The state university at Bloomington, De Pauw University at Greencastle, Purdue University at Lafayette, the University of Notre Dame, the largest Catholic institution in the west, Hanover and Wabash Colleges, at Hanover and Crawfordsville, and Rose Polytechnic Institute at Terre Haute are a few among the many institutions of higher learning. The State University, Purdue with its Agricultural School, and the State Normal School at Terre Haute, receive State aid.

Transportation. There are 7,420 miles of railway; much traffic is conducted over Lake Michigan and the Ohio and Wabash Rivers; and the electric lines measure 1,597 miles.

The state was first settled by the French under Beaubois, in 1731, at Vincennes on the Wabash. It was ceded to Great Britain, and in 1783, after the Revolutionary War, it became the possession of the United States. In 1787 it became part of the Northwest Territory, and in 1800 was made a separate territory, entering the Union in 1816. Early in the 19th century the settlements were disturbed by hostile Indians under the famous chief, Tecumseh. General Harrison marched to Tippecanoe on the Wabash, Nov. 6, 1811, and on the following day there was a desperate battle, in which the Indians were defeated, afterward suing for peace. See *Settlement of Wabash Valley* by Cox and *History of Indiana* by Goodrich and Tuttle.

Indianap'olis, the capital and largest city of Indiana, is situated on the west fork of White River, on a level plain near the center of the state, 185 miles from Chicago. It is a regularly built and beautiful city, with a handsome state-house and other public institutions. Its annual expenditure for public schools is in the neighborhood of $700,000, and the value of its public school property is close upon $2,500,000. There are seven parks. Indianapolis is one of the chief railroad centers, 15 lines centering here. The trade in agricultural products is very considerable; milling and pork-packing are the leading industries, and its stock-yards cover 100 acres. The site was chosen in 1820, when the plain was covered with a dense forest. It has large grain-elevators and flouring-mills; and its manufacturing establishments, which include extensive rolling-mills, meat-packing establishments, iron works, foundries and machine-shops, carriage-works, cotton and woolen mills etc., employ over 20,000 hands. Population 233,650.

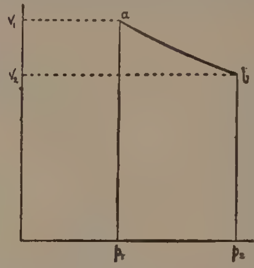
In'dian or **Malay' Arch'ipel'ago** is the most important system of island groups in the world. It is bounded on the north by the China Sea, on the east by the Pacific, south and west by Australia and the Indian Ocean. There are three principal groups, the first comprising the Molucca Islands, Spice Islands and the Philippines; the second including Sumatra, Java and the Sunda Islands; the third being made up of Borneo, the Celebes and smaller islands. The chief islands for trade are Java, Sumatra, the Moluccas and Borneo. Native rajahs or princes rule over several of the islands, which are inhabited by Malays, but most of the islands belong to the Dutch. The main products are sugar, coffee, indigo, rice and tea. Gum elastic, resin, pepper, rattans, drugs, ivory and opium are also exported. Fine timber trees abound, and the vegetation is most luxuriant. See *Malay Archipelago* by Wallace and *History of Java* by Raffles.

In'dian Ocean, one of the five great divisions of the universal ocean and the third in size, lies south of Asia, between Africa, the Antarctic Ocean, Australia and the Indian Archipelago. It gradually narrows from south to north, and is divided by the peninsula of India into the Bay of Bengal on the east and the Arabian Sea on the west, the latter branching off again into two arms, the Persian Gulf and the Red Sea. In early history the Indian Ocean was known as the Erythræan Sea. The Phœnicians were familiar with this ocean at a very early date, and, as a channel of commerce by the navies of King Solomon, it came to be the first ocean crossed for trade. In the 9th century the Arabs made frequent voyages across the ocean, crossing the Bay of Bengal into the China Sea. Many small islands dot its waters, but the only large ones are Madagascar and Ceylon. The Euphrates, Tigris, Indus, Ganges and Irrawaddi Rivers from Asia and the Zambezi from Africa flow into it.

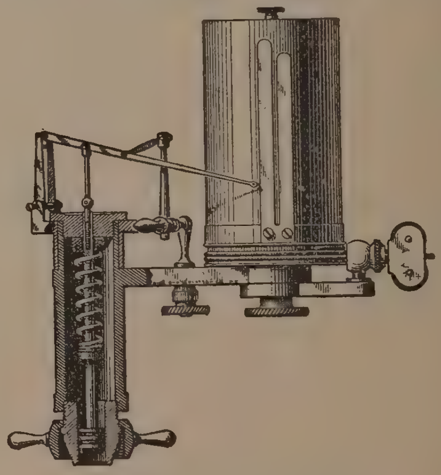
Indians, Amer'ican, the name given to the people found in North and South America when discovered by the Europeans. They were called Indians because the newly found land was supposed to be a part of India. These scattered tribes, while varying in civilization from the rudest savages to the cultivated Aztecs of Mexico, and Incas of Peru, are now thought to belong to the same race. They are brown or copper-colored, with straight, black hair, high cheek bones, head rather square and flattened behind. Their origin is uncertain, though all the tribes have traditions of an early emigration from some region either north or south. The most civilized tribes when America was discovered, were those found from New Mexico to Peru. They had buildings of which remains are still found; while the northern Indians dwelt in tents or other movable buildings. All the tribes were hunters and fishers, raising a few crops, as corn, beans and tobacco. They made pottery, stone pipes, arrowheads, snowshoes and bark canoes and baskets. The Pueblo Indians of New Mexico built towns and temples. The Mexican and Peruvian tribes had modes of keeping records. They were governed by chiefs, who sometimes were made such by inheritance and sometimes by merit. They believed in a future life, and carefully buried their dead. In South America and Mexico the Indians have largely mingled with the conquering races, and are much less distinct from them than in the United States. The Indian wars of the United States began in Virginia in 1622 and in New England in 1637, and continued at intervals, with many victories by the Indians and terrible massacres of the whites; but in the long run with the sure defeat of the savage by the arts and arms of civilization. The Indians have been steadily pushed westward, and have been deprived of their lands by treaties, which have again and again been broken. The present policy of the United States government is to break up the reservations, do away with the tribes and make citizens of the Indians. Schools have been established, and there are 12 government training schools for Indian youth, where from 3,000 to 4,000 can be cared for. In 1907 the appropriation made by Congress for Indian schools was over $9,000,000. In 1887 Congress confirmed the Indian title to all reservations, of which there are about 133, including 116,000,000 acres. Every Indian in the United States, with the exception of the Alaska Indians and those of the five civilized tribes, could receive 160 acres apiece, and still enough land be left to pay the entire cost of educating the Indian children. The whole number of Indians in the United States, leaving out Alaska, in 1905 was 284,079. They are found in Maine, New York, North Carolina, Michigan, Minnesota, Iowa, Montana, Nebraska, Oregon, Washington, North and South Dakota, Colorado, Idaho, Arizona, Nevada, New Mexico, Utah, Wisconsin, Wyoming, California, Texas and Oklahoma. Some of the principal tribes, at present, are the Choctaws, Cherokees, Creeks, Chippewas, Chickasaws, Sioux, Illinois, Sacs, Foxes, Seminoles, Comanches, Apaches, Navajos, Pueblos, Cheyennes and Nez Percés. See *A Century of Dishonor* by Helen Hunt Jackson; *American Indians* by Catlin; *Native Races of the Pacific States* by Bancroft; *Story of the American Indian* by Brooks; and *Red Race of America* by Schoolcraft.

Indian Territory. See OKLAHOMA.

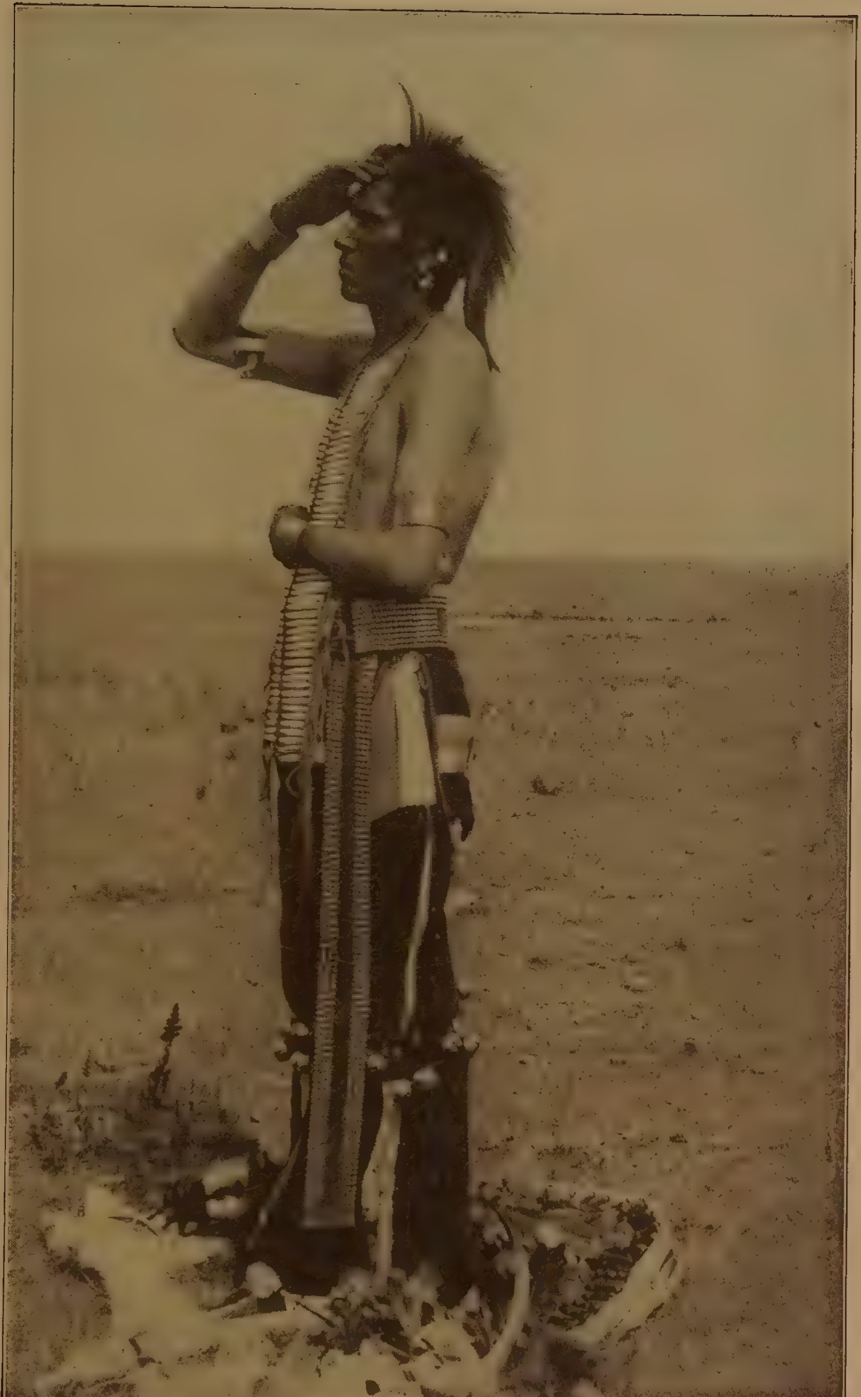
In'dica'tor (steam-engine), an instrument for drawing automatically a figure showing the instantaneous expansions and also the corresponding pressures of the steam in a steam-engine cylinder. The figure is called an indicator diagram. The expansion of the steam multiplied by the pressure gives the work the steam is doing. By letting vertical distances represent volumes, the area of the figure equals average pressure times change of volume or area equals work done.



The common indicator is due to Richards. It consists of a small cylinder which can be connected to the cylinder of the steam-engine. The pressure of the steam acts on the piston in the indicator cylinder and compresses a spiral spring. The amount of this compression is indicated by a pointer and measures the pressure. The pointer moves up and down with the changes of pressure, tracing a line on a paper wound on a small drum. This drum is attached to the piston-rod of the engine, so that it rotates backward and forward with the motion of the piston. But the position of the engine piston gives the volumes of the steam in the cylinder. The pointer thus traces a figure in which horizontal changes represent expansions or changes in volumes, and vertical distances represent changes in pressure. The indicator diagram is used to study the performance of the valves of an engine and also to calculate the work the steam is doing. This is called indicated power as distinguished from brake-power, which is the power deliv-



A STEAM-ENGINE INDICATOR



CHIEF YELLOW BOY GIVING THE PEACE SIGN
Note that he has dropped his cartridge belt and war bonnet at his feet.

ered at the fly-wheel. The brake-power is the indicated power less the losses by friction and similar causes in the engine.

In'digo, an important vegetable dyestuff, yielding a dye of a deep and lasting blue; the basis also for the best black dye in woolen goods. It has been used in India from an early period, and was imported by the Greeks and Romans. It is obtained from a shrubby plant two or three feet high, with rounded leaves and pale-red flowers, belonging to the family of the bean. At the time of harvest the plant must be three months old and in blossom. The plants are cut down, but soon shoot up again, and yield a second and often a third cutting in one year. Bengal is the chief seat of the indigo trade, and large quantities are imported into our own country and Great Britain. Artificial indigo is now made on a large scale, in Germany, from coal-tar products.

Indigo Bird, a bird about the size of a canary, common in the United States and belonging to the finch family. The male is indigo-blue, "the bluest bird that flies in North America," the female a dull brown color and difficult to distinguish from several other small birds. Although naturally shy, they breed near habitations. The nest is often placed in low bramble or brier bushes. They arrive in May and depart for tropical America in September. During the time of their sojourn, the male keeps up a merry and almost continuous singing. In the warmest weather, even in the heat of midday, he is not daunted, but continues his song.

In'do-Chi'na or **Further India,** is the name given to the French possessions in the Anamese peninsula, which extends, in Chinese waters, from the Gulf of Tonquin southwestward to the Gulf of Siam. The region embraces Tonquin or Tonking, Anam, Cambodia, Cochin-China and Laos (*q. v.*).

In'do-Europe'an or **Ar'yan** is the name usually applied to the races and languages of Europe, with a few exceptions, and to the southwestern part of Asia. There are seven principal divisions — the Germanic or Teutonic, the Slavic, Celtic, Italic, Greek, Persian and Sanskrit or Indian. The Germanic branch includes Swedish, Norse, Dutch, Danish, German and English; Irish is a Celtic language; Latin, French, Spanish and Italian are Italic; and Russian is Slavic. The study and comparison of languages prove that all these languages had the same origin and, therefore, that the races originally were the same. The oldest literature in these languages is in the Sanskrit language, and is found in the sacred books of the Hindus. See *Science of Language* by Max Müller and *Language and the Study of Language* by Whitney.

In'dra, a word meaning to see or to discover, is the name of a Hindu god worshiped in the early period of the Hindu religion. He was called "the protector of the pious, the lord of the virtuous and the upholder of heaven, earth and firmament." All the wonderful deeds of Indra, related in legends, were performed for the benefit of the good and wise. He is represented in human form with numerous eyes, and often pictured as riding on an elephant.

Induc'tion Coil, an electrical instrument employed to raise (or lower) the voltage of an induced current above (or below) that of the primary current. The essential parts of such an instrument are a primary coil of wire, a secondary coil of wire, an iron core and a source of alternating current or a source of direct current which is automatically interrupted. In the ordinary transformer, which is an induction coil used in electric lighting, the primary and and secondary coils are wound side by side on an iron core, as shown in Fig. 1. The iron core generally has the form shown Fig. 2. Alternating currents are practically always employed in induction coils of this type. But in the laboratory form the secondary coil is generally wound over the primary, as indicated in Fig. 3. The battery at B magnetizes the iron core. The iron core attracts the vibrator I, and this interrupts the current at K, as will be evident from the diagram. The primary current, therefore, becomes an intermittent. The number of lines of force cutting the secondary at each interruption is

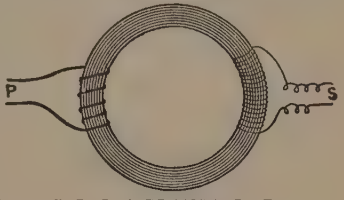


FIG. I. A TRANSFORMER

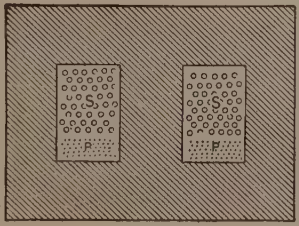


FIG. 2.

(Transformer cores are made of a pile of iron plates having this shape.)

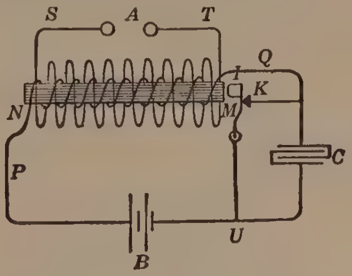


FIG. 3. RUHMKORFF COIL.

enormous; and hence the electromotive force in the secondary is enormous. Such a form is generally known as a Ruhmkorff coil, after one of its early makers. The finished appearance of a typical Ruhmkorff coil is shown in Fig. 4. In the transformer used for house-lighting the secondary circuit contains fewer turns of wire than the primary, and hence the transformer reduces the voltage; but in the Ruhmkorff coil the secondary contains many times as many turns as the primary, and hence raises the voltage. In the transmission of power over long lines, one induction coil is used at the generating station to raise the voltage, and another is used at the receiving station to reduce the voltage, thus securing the economy of transmission which comes from the use of high voltage. For further details, see Thompson's *Elementary Lessons in Electricity and Magnetism.*

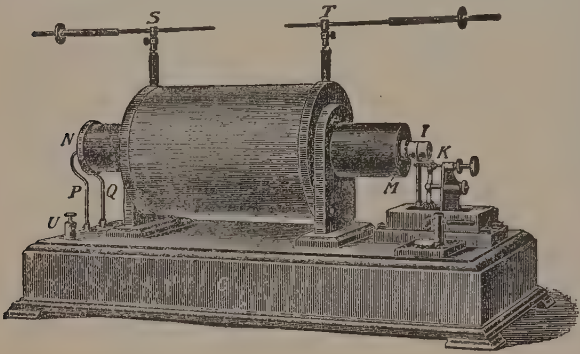


FIG. 4. INDUCTION COIL

Indu'sium (in plants). A flap-like outgrowth of the epidermis in ferns, which covers the sorus or group of sporangia. See FILICALES.

In'dus River ("to flow"), is the great river of India, which bounds Hindustan on the west. It rises in Tibet, 16,000 feet above the sea, on the north side of Kailasa, a peak of the Himalayas. It flows through deep wild gorges, with steep sides, rising as high as 10,000 feet. The Indus abounds in fish of fine quality, and is infested with crocodiles. In the lower part of its course the river divides into many channels. The main channel is constantly changing, and the bed of the river is dotted with islands and sandbanks. The total length of the river is 1,900 miles. The delta, formed by the channels at the mouth, covers an area of about 3,000 square miles, and extends for some 125 miles along the Arabian Sea.

Indus'trial Schools have grown up chiefly as a substitute for the old system of apprenticeship, which (according to a U. S. Bureau of Labor Report) has declined from (1) production on a large scale, which destroys the personal relations between the master and apprentice; (2) the extensive use of machinery and subdivision of labor; (3) the unwillingness of employers to take on apprentices; (4) the unwillingness of journeymen to instruct apprentices; and (5) the dislike of boys for apprenticeship.

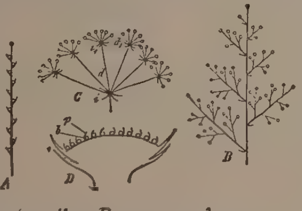
Industrial schools seek to maintain the efficiency of a system of apprenticeship, while preserving the personal relation between teacher and taught, enabling a boy to move freely from task to task within his trade, overcoming his dislike for the learning operation, and continuing his liberal education. Germany has a thorough system of public industrial education in all grades, in all branches and for all classes. The U. S. has no such system, save one which is in process of organization in Massachusetts, but has private industrial schools and some industrial training in the public schools. Technical and polytechnic schools (*q. v.*) might be regarded as secondary industrial schools. Apart from these, there were no schools of an industrial character in the U. S. until 1870. In that year Massachusetts introduced industrial drawing into the public schools; and by 1890 this subject was taught in 201 out of the 351 cities and towns of the state. The law of 1898 made drawing compulsory in the public schools of Massachusetts, and required the foundation of evening-schools for drawing in towns of more than 10,000 inhabitants. Sewing was required of girls in Boston in 1870. Manual training was attempted in New York in 1874, and is now widely taught in its public schools. In 1900 it was offered in the public schools of 169 towns of more than 8,000 inhabitants. The larger cities have established manual-training high schools, in which four years are given to courses in manual practice alongside the regular curriculum of the high school. The extension of industrial drawing in the public schools led to the foundation of schools of industrial design. Such are the Lowell School of Practical Design, Mass. (1872), the School of Industrial Art, Philadelphia (1877), the Rhode Island School of Design (1878); and recently many others. The Textile School grew out of the School of Industrial Art at Philadelphia, and has been followed in eight or ten cities.

In the south, industrial schools have been founded for the education of the colored race. Hampton Institute, which opened in 1868, was so successful that a number of similar schools have sprung up, that at Tuskegee, Alabama, having more than 1,000 pupils.

Elementary industrial education in the U. S. is promoted also by continuation schools (*q. v.*) and evening-classes in connection with technical institutions. But it seems clear that a thorough system of day public industrial schools is needed The first commission on industrial and technical education in Massachusetts made a report in 1906, in which it was advocated that a commission be appointed for a term of years to provide industrial schools independent of the existing public schools, to be adapted for boys and girls of from 14 to 16 years of age. These schools are to be supported by the municipality, aided by the state in proportion to local expenditure. Such a commission has been appointed, with Mr. C. H. Morse as secretary, and with it the first public system of industrial schools in the U. S. was established in 1907.

Iner'tia, a general property of matter, in virtue of which all bodies tend to remain in their present state of motion or of rest. Inertia is the Latin word for laziness; but the laziness of matter is such that it hesitates to stop, when once set in motion, quite as much as it hesitates to start, when once at rest. Used quantitatively, inertia is equivalent to *mass* or *quantity of matter.* Newton showed that the inertia of a body is strictly proportional to its weight, and hence we measure the inertia of a body by weighing it Hicks and others have invented balances by which the inertia of bodies may be compared without weighing them; and this is the really fundamental method of measuring the quantity of matter in a body. See DYNAMICS.

In'fantry. See ARMY.



A, spike: *B*, compound raceme, *C*, compound umbel, *D*, head.

In'floresc'ence. Flowers either may occur solitary upon plants, or they may be collected together in a definite region of the plant body, which region is then termed the inflorescence or flower-cluster. Flowering plants, therefore, have their flowers either solitary or in an inflorescence. Great attention has been paid to the various forms of inflorescence, since they are quite constant in different plants, and are really serviceable in distinguishing them. The various flower-clusters are not always easy to separate, as they pass gradually into one another, but the prominent forms are easily distinguished. There are two general types of inflorescence, known as the "botryose" and "cymose" types. In the botryose type the lowest flowers are the oldest, the buds being above, and the flowers continue to bloom upward in what is called acropetal succession, that is, toward the apex. In the cymose type this order is reversed, the first flower being the terminal one and the buds successively arising below, the succession of blooming being basipetal, that is, toward the base of the plant. The botryose forms of inflorescence are much more numerous and various than the cymose. The prominent botryose types are: "Raceme," in which the flowers are distributed upon an elongated axis, each upon its own pedicel, as in spring beauty; "panicle," which is really a compound raceme, in which the flower stalks branch again as in the spray-like clusters of grasses; "Thyrsus," a compact pyramidal panicle, as the lilac or a cluster of grapes; "Corymb," in which the lower flower stalks are elongated, thus bringing all the flowers up to a level, resulting in a flat-topped cluster; "Umbel," in which the axis is shortened and the numerous pedicels arise from the same point, like the ribs of an umbrella, resulting in a flat-topped cluster, as in the common carrot, the name umbel being derived from its umbrella-like form; "Spike," in which the flowers are sessile along an elongated axis, as in the plantain; "Spikelet," a small spike or one member of a branching spike, the name being applied chiefly to the smaller clusters in the grass inflorescence which go to make up the spike or panicle; "Head," in which the flowers are sessile or nearly so upon a shortened or broadened axis, as in the sunflower, dandelion etc.; "Ament" or "Catkin," in which the flowers on the elongated axis are subtended by conspicuous bracts which overlap one another and completely cover them, as in the pussy willow, birch, alder etc.; "Spadix," in which the axis becomes fleshy, bearing minute sessile flowers, and is more or less overarched by an enormous bract known as the "spathe," as in Jack-in-the-Pulpit, calla lily etc.

It will be noticed that certain definite relations exist among these forms, so that they may be referred to one another easily. The raceme seems to be the more primitive type of inflorescence, and the others are more or less modifications of it. For example, the corymb is a raceme in which the lower pedicels are elongated, so that a flat-topped cluster is produced; an umbel is a raceme in which the axis has been much shortened, so that the pedicels are thrown together; a spike is a raceme in which the flowers are sessile; a spadix is a fleshy spike; a head is an umbel with sessile flowers; while a catkin or ament is a spike with unusually conspicuous bracts. The cymose inflorescence is chiefly represented by the cluster known as a "cyme," a flat-topped cluster resembling the corymb; but the central flowers, that is, the uppermost, bloom first, so that the succession of blooming is toward the outer part of the cluster, as in the common elder.

JOHN M. COULTER.

In'fuso'ria, microscopic animals common in stagnant water and in infusions of vegetable and animal substances. Formerly, certain microscopic plants, which have the power of movement, were confused with them, and a general term *animalcula* was used to designate all microscopic life. The infusoria are single-celled animals, the largest being just visible to the unaided eye. They constitute a natural class of the subkingdom protozoa. They were discovered by Leeuwenhoek in 1675, about the time the microscope in a simple form was coming into use. They swim by means of numerous, hair-like processes extending from the body and called cilia or by one or two larger strands of protoplasm called flagella. A few are attached to stalks. The chief divisions of the infusoria are into ciliata and flagellata. The former are easily separated into smaller divisions according to the arrangement of the cilia. See PROTOZOA.

In′galls, John James, an American lawyer, essayist and statesman. He was born at Middleton, Essex County, Mass., Dec. 29, 1833. He graduated at Williams College, studied law, and was admitted to practice in Massachusetts in 1857, and in 1858 went to Kansas. He was elected United States senator from Kansas in 1873, and was again elected in 1879 and in 1885. Ingalls was noted for scholarly attainments and quick and acute perception. He was an eloquent speaker, his power of sarcastic rejoinder being a marked trait. As a writer of essays and a lecturer his diction was elegant and concise, and he excelled in the power of picturesque description. He was the author of the famous single-stanza poem *Opportunity.* He died at Las Vegas, New Mexico, Aug. 16, 1900.

Ingelow (*ĭn′jĕ-lō*), **Jean,** a popular English poet and novelist, was born at Boston, Lincolnshire, England, in 1820. A great part of her poetry is of a devotional type, sweet and simple and filled with beautiful thoughts. Among her noted works are the poem, *Divided,* the ballad, *High Tide on the Coast of Lincolnshire,* and the larger poem, *A Story of Doom.* Her works of fiction are *Off the Skelligs, Fated to be Free, Sarah de Berenger, Don John* and others. She died at London on July 20, 1897

In′gersoll, Robert G., a prominent lawyer, a politician, and a sceptical writer and lecturer on religious topics, was born in New York in 1833, and died in 1899. His oration in favor of J. G. Blaine at the Republican convention of 1876 showed him to be a great orator, and lecturing thenceforth became his occupation. His works include *The Gods; Ghosts; Some Mistakes of Moses; What Shall I do to be Saved? Great Speeches;* and *Prose Poems.*

In′graham, Duncan Nathaniel, a Confederate officer, was born in South Carolina in 1802. Entering the United States navy as midshipman in 1812, he became captain in 1855. He commanded the *St. Louis,* sailing in the Mediterranean, and prevented the arrest, by the Austrians at Smyrna, of Martin Koszta, a Hungarian, who had declared in New York his intention of becoming an American citizen. The course of Captain Ingraham was approved by our government, and Congress voted him a medal. He was made chief of the bureau of ordnance, resigning in 1861 to take a like position in the Confederate navy, where he became commodore. He died in 1891.

Inher′itance-Tax. This tax is imposed on those acquiring property by inheritance or will. It is often imposed simply for the revenue it brings in; for it is easy and cheap to collect, hard to evade and one of the least unpopular forms of taxation. In most countries some form of inheritance-tax exists, and in most of our states. A special form of the tax is called the collateral inhertance tax, which imposes a higher rate upon property that is willed to distant relatives or to strangers. The form of inheritance tax that is exciting special interest at this time is one that charges a higher rate on larger fortunes, and has for its purpose not revenue only, but the diminution of large inherited fortunes. The Australasian colonies seem to have led the way in imposing such graduated inheritance-taxes. England adopted it in 1894 as a means to meet her great expenses. Congress has imposed such a tax on three occasions: from 1797 to 1802; for eight years between 1862 and 1870; and from 1898 to 1902. In the earlier of these the rate was much less on very small fortunes.

Injec′tor, an instrument used to force water into a boiler by using the energy in a jet of steam taken from the boiler into which the water is to be forced. It is simply an instrument for allowing steam to escape from a boiler through a suitable nozzle and to suck up and mix with a stream of cold water, by which it imparts so much of its own energy that the combined mass of cold water and condensed steam enters and feeds the boiler. The injector takes many special forms given by different makers and for special conditions. The injector was invented in 1858 by H. J. Giffard, a French mathematician and engineer. It is used universally on locomotives. It is said that "it is without doubt better than any device hitherto used for feeding boilers and the best that can be employed, and also is the simplest and the most ingenious."

Initiative, Referendum and Recall. The Initiative is a method of popular control by which a minority, ranging from 5% to 25% of the voters, may petition for a state law or city ordinance. The proposed enactment must then, without change, be voted upon. If approved by a majority, it becomes a law. Laws and ordinances so passed are not subject to veto. The Initiative originated in Switzerland and has been extensively adopted in this country, particularly in states where cities have the Commission (*q. v.*) form of government. In commission governed cities the Referendum, under which by petition any ordinance already enacted must be similarly referred to the voters for approval, is quite common. Since 1898 it has also been used in state legislation to a greater or less degree. Another form of popular control of government is the Recall, under which by petition the voters may recall or remove from office any official whose conduct they disapprove.

Ink, any fluid which may be used for writing or printing. The two most important kinds of ink are writing ink and printing ink. India ink, the best of which is made in China and Japan, is a mixture of carefully prepared lampblack and gum. It is very black and perfectly permanent, and is used largely in making drawings. The main ingredients of common black ink are galls, sulphate of iron and gum arabic.

Ink'erman, Battle of, occurred in 1854 at the small Tartar village of the same name, in the Crimea. It is situated near the eastern extremity of the harbor of Sebastopol. The battle took place, during the Crimean War, between 60,000 Russians and 14,000 allied English and French forces. About six o'clock in the morning of Nov. 5, the Russians marched out, their movement being concealed by darkness and a drizzling rain. Suddenly they appeared crowding upon the slopes of the plateau upon which were posted the opposing forces. Only a handful of men, 1,400, made a heroic stand for six hours against overwhelming odds, when re-enforcements drove the Russians defeated from the field. See Kinglake's *History of the Crimean War.*

In'man, Henry, an eminent American painter, was born in Oct., 1801, at Utica, New York. He became a pupil of Jarvis, and early excelled in miniature painting. His genius was broad, extending to portraits, landscape and historical subjects. Among his best works are *Rip Van Winkle Awaking from His Dream*, *Mumble Peg*, *The Boyhood of Washington* and portraits of Wirt, Audubon, Van Buren and Seward. He died at New York, Jan. 17, 1846.

Inn'ess, George, an American painter, was born at Newburg, N. Y., May 1, 1825. He began landscape-painting at 21 in New York city, and later went to Europe, residing in Italy for a considerable period. Returning to America about 1868, he lived in New York until 1871, when he again went to Italy, where he lived until 1875. He became a member of the National Academy in 1868, and at the Paris Exposition of 1889 received a third-class medal. After his death, which occurred at the Bridge of Allan, Scotland, Aug. 3, 1894, 240 of his pictures were sold at auction for $108,670. He ranks as one of the best of the American landscape-painters.

GEORGE INNESS

In'nocent, the name of 13 popes, the most remarkable being:

Innocent I, a native of Albano, who was elected bishop of Rome in 402 A. D. His rule is one of the most important and energetic in the history of the Roman church. He condemned heretics, sent legates to represent the church in distant countries, insisted on the rights of the bishop of Rome to receive and judge cases appealed to him, and enforced with the clergy the prohibition of marriage. He died in 417, and was put on the list of saints. St. Innocent's Day is July 28.

Innocent III (G. Lothario Conti) is esteemed the greatest pope of this name and one of the very greatest among all the popes. He was born at Anagni, Italy, in 1161. His school training was received at Paris, at Bologna and at Rome, where he was made cardinal. In 1198, at the early age of 37, he was elected the successor of Pope Celestine III. He then was in the full vigor of manhood — his mind filled with lofty purposes and ambitions. He believed that to the successors of St. Peter Christ had given power not only over the church but over the world. The crowns of kings and the destinies of nations were to be placed in the hands of the popes. Almost every state was brought under his power, Italy, France, Spain, England and Germany, through their rulers, obeying his dictates. It was at his call that the crusade against the Albigenses was begun. He was a careful guardian of public and private morality; a protector of the weak; and zealous to suppress evils of all kinds in society. All the force of his power and influence was given to founding the great Franciscan and Dominican orders of monks. In 1216 he died at Perugia at the age of 56. His character has been spoken of by historians as "high and blameless, wise and gentle." See *Latin Christianity* by Milman and *History of the Popes* by Ranke.

Innocent XI (Benedetto Odescalchi) was born at Como, Italy, in 1611, and elected pope in 1676. He was distinguished for learning and for nobility and force of character. His historical renown is mainly owing to his contest with Louis XIV of France. A dispute arose about the right of the king to keep bishops from their charges and to retain the revenue from the vacancies thus caused. The pope gave notice that he would not receive the credentials of any new ambassador at his court who would not renounce this claim. Louis resisted this decree and sent a large body of military and naval officers to support his pretensions. Innocent was immovable, and still refused to admit the ambassador of France. Louis then seized the papal territory of Avignon in reprisal, but the pope remained firm in his decision. Before the dispute terminated, Innocent died in 1689. See *The Ring and the Book* by Robert Browning.

Innsbruck (*ins'brook*), is the capital of Tirol, Austria. It stands on the River Inn, 1,880 feet above the sea, and is overhung by mountains ranging from 7,500 to 8,500 feet in height. It is a pretty place, with broad streets shaded by fine trees. It contains many beautiful public buildings, and has four large squares or parks adorned with statues. There are a university with 102 professors and 1,009 students, founded in 1677; an old Franciscan church; an imperial castle; and eight monasteries. The city carries on manufactures of woolen cloth, machinery, glass and glasspainting. It is a place of some commercial importance, owing to its situation at the head of Brenner Pass on the route to Italy. Population 27,056, exclusive of the suburbs.

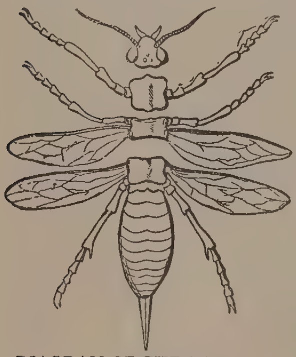
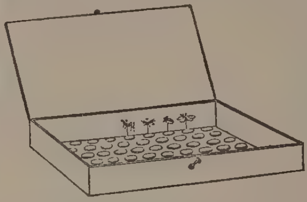


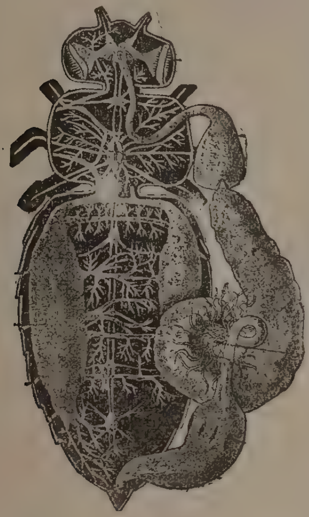
DIAGRAM OF THE PARTS OF AN INSECT.

In'sects, the most abundant of all animals known by their jointed body, six legs and distinct head, thorax and abdomen. The spiders, which are closely related, have eight legs and a united head and thorax. The head carries eyes, antennæ or feelers and mouth parts; the thorax consists of three parts carrying the legs and wings; the abdomen has egg depositors, stings etc. Insects breathe by means of air-tubes which open upon the exterior. The openings are buttonhole-shaped, and are usually situated on the joints of the abdomen. Most insects are hatched from the egg in the form of a caterpillar or grub and pass through a series of changes (see CATERPILLAR, MOTH and BUTTERFLY) called the metamorphosis. In others, like the grasshopper, there is an incomplete metamorphosis, for the egg hatches into a six-legged, immature insect, resembling the adult in general form, but without wings. These grow and moult, and gradually develop wings, but at no time do they pass into a cocoon or pupa stage. Insects are easily preserved, and a cabinet or collection can be begun with a very simple outfit. There are required a net; a collecting bottle; pins; and a box for holding the collection. They may be killed with benzine, chloroform etc., but, for all except butterflies, a collecting bottle is more convenient. Provide a wide-mouthed bottle with a good cork that fits tightly; in the bottom put an ounce of potassium cyanide broken into lumps no larger than a filbert; add sawdust somewhat more than to cover the largest lumps; then pour in a quarter of an inch layer of plaster of paris mixed to the consistency of thick cream. The bottle should be kept tightly corked and great care taken not to breathe the fumes of the cyanide, which are very poisonous. Insects put into the bottle are killed almost instantly by the fumes coming through the plaster and saturating the air. Care should be taken in the spreading of the insect; while still flexible the various parts — wings, legs etc. — should be arranged as it is desired they should appear when dry. Insect-pins or fine needles mounted on match-sticks are needed for this, and nothing else save some cards or thin boards — grape-basket covers or cigar-box wood. The natural position of the insect should be studied and attempted. Dust-proof boxes are made for holding insects and especial pins manufactured, but common pins and a shallow cigar-box will do for the beginner. Pieces of cork can be glued to the bottom and pins inserted in the cork.



INSECT COLLECTORS BOX

Insect Anatomy. There is nothing more fascinating than the study of the internal anatomy of insects. The delicacy of their structure is a marvel. The organs are outlined in white, often like fine tracery, and it is a matter of continual surprise to the observer to find within such small compass all the different systems of organs represented. They should be dissected under water — pinned out on a piece of soft wood or loaded cork — in order to float out the delicate parts which will otherwise become matted together. This field of observation was opened by Malpighi (1628–94), who in 1669 wrote a celebrated monograph on the anatomy of the silkworm, fully illustrated. This was the beginning of insect anatomy. He was so profoundly impressed with the beauty and delicacy of what he saw that he said: "In performing these researches so many marvels of nature were spread before my eyes that I experienced an internal pleasure that my pen could not describe." Swammerdam (1637–80) engaged in similar work. He was a critical and careful worker, and made observations on the metamorphosis as well as the structure of insects. His publications on the anatomy of the honeybee and the mayflies were very fine. But the golden period of close observation and artistic illustration was reached in the work of Lyonet (1707–89). In 1760 was published his monograph on the minute anatomy of the larva of the willow moth. He counted more than 4,000 muscles in the body of that tiny animal, and traced the branches of nerves and breathing tubes to individual muscles. It is unsurpassed as a piece of delicate work, and his sketches are as fine as any ever executed. Strauss-Durckheim (1790–1865) comes next in succession. His monograph on the anatomy of the cockchafer (1828) rivals that of Lyonet in accuracy and detail. He wrote under the influence of Cuvier, who had introduced the comparative method into anatomy, and he undertook to make insect anatomy comparative. Newport of England carried the work to a higher level, and began to observe the embryology of insects. Since his time much work has been done on their microscopic structure. Franz Leydig has been a pioneer and leader in this line, and his studies on the anatomy of sense-organs of insects are famous. The embryology of insects has also been studied with success by a very large number of observers.


INTERNAL SECTION OF THE HONEYBEE

Insects are of interest to the naturalist from the standpoint of their structure, metamorphosis, embryology and classification. They are of importance to the agriculturist on account of the injuries they cause to crops, shade trees etc. "It has been calculated that insects about equally divide the produce of the soil with the farmer." Many states support a state entomologist to limit the ravages of injurious insects like the army worm, weevils, Hessian fly, locusts etc. (consult these topics). The simplest insects are worm-like and wingless, or with rudimentary wings, thus suggesting affinities between insects and worms. A very interesting form, named peripatus, has been discovered in Africa, Australia and South America that unites the two groups. This is a long-jointed animal resembling a worm externally, except that it has antennæ and jointed legs. Internally it has breathing tubes, which belong to insects as a class, and a pair of secreting tubes in each joint, except a few at the extremities. These tubes correspond to secreting tubes of worms.

Classification of Insects. Insects are grouped into orders, mainly according to the nature of their wings. It is estimated that there are about 300,000 species. They are so multitudinous that reference must be made to a textbook on entomology for any adequate treatment. Nevertheless, it will be convenient for the amateur student to have a means of recognizing the order to which any common insect belongs. It will be simpler to begin with the highest order of the class *Insecta* and pass downward:

IX: *Hymenoptera*, bees, wasps, ants, ichneumon flies and others. Insects having four membranous wings with few cross veins. Mouth-parts formed for biting and sucking. The highest developed of insects in organization and intelligence. (See Lubbock, *Ants, Bees and Wasps*. See, also, ANT, BEE, ICHNEUMON FLIES, WASP etc.) VIII: *Coleoptera*, beetles. Insects with hard wing-covers, the inner membranous pair used only for flying. This is the most numerous order, there being more than 11,000 species known in America north of Mexico, and the number in tropical regions is immense. (See BEETLE, CARPET-BEETLE, WEEVIL etc.) VII: *Diptera*, flies, gnats, midges and others. Two-winged insects with mouth-parts formed for sucking. (See GNAT, HESSIAN FLY, MOSQUITO etc.) VI: *Lepidoptera*, butterflies, moths and others. Insects with four wings covered with overlapping scales. Mouth-parts formed for sucking. (See ARMY-WORM, BUTTERFLY, CATERPILLAR, MOTH etc.) V: *Neuroptera*, ant-lion, dobson and others. Insects having four membranous wings with numerous veins. Mouth-parts formed for biting. Formerly the dragon-flies and others were included in this order, but the modern entomologists have split the old order into ten new ones. IV: *Hemip-*

SWALLOW-TAIL BUTTERFLY

tera, all true bugs, plant-lice, seventeen-year locusts and others. Insects with four wings, constructed on two types—some with outer wings, thickened at the bases and thinner tips, which overlap on the back; others with wings of the same thickness throughout. Mouth-parts formed for sucking. The metamorphosis is incomplete. (See Chinch-Bug, Cicada, Electric-light Bug etc.) III: *Orthoptera*, grasshoppers, crickets and others. Insects with four wings, the outer pair being straight and not used for flying; the inner pair or flying wings are folded like the plaits of a fan. Mouth-parts formed for biting. Metamorphosis incomplete (See Cricket, Grasshopper, Katydid etc.) II: *Odonata*, dragon-flies and others. Insects with four membranous wings finely netted with veins. Mouth-parts formed for biting. Metamorphosis incomplete. (See Dragon-Fly.) I: *Thysanura*, spring-tails, bristle-tails and others. Insects without wings which undergo no metamorphosis. The larval form is retained by the adult. In some cases, in addition to the six legs belonging to all insects, there are rudimentary legs on the abdomen. They form a sort of connecting-link between the other insects and the myriapods. Besides the insects mentioned above, the mayflies, stone flies, white ants, book lice, bird lice, thrips, scorpion flies and caddice flies each separately represent an order in the modern classification of insects.

LEPISMA, A SPRING-TAIL

Insects and Flowers. Insects are of the greatest value in that they practically create by cross-pollination our beautiful and fragrant blossoms and our most valuable varieties of fruit. In destroying injurious insects, however, little hesitation need be felt, for the honeybee alone is "practically sufficient for the work of cross-pollination of fruits and flowers." (Hodge.) While a few feed upon flower-petals, by far the greater number are attracted by the pollen or nectar, the nectaries being so placed that the insect will have to touch anthers and stigma in getting to its feast. Pollen clinging to the insect is brushed against the stigma of a flower of the same kind visited by the carrier, clings to the stigma and is conveyed to the seed-cup, and the flower is fertilized. Insects that, in addition to the bees, are agents in cross-fertilization include wasps, most butterflies and moths, certain bugs, flies and beetles.

See Hodge: *Nature Study and Life;* Comstock: *A Manual for the Study of Insects* and *Insect Life;* Belle S. Cragin: *Our Insect Friends and Foes;* Weed: *Life Histories of American Insects;* French: *Butterflies and Moths of the Eastern United States;* Holland: *The Butterfly Book;* Packard: *Guide to the Study of Insects* and *Textbook of Entomology*; Scudder: *Everyday Butterflies*; and Smith: *Economic Entomology.*

In′stitute of France, The. The principal philosophical and literary society of France, originally proposed by Richelieu, for which letters patent were issued in 1635 under the name of the Académie Française. Later many new bureaus or departments were added, as the Academy of Inscriptions and Belles-Lettres; the Academy of Sciences; and those of sculpture and painting, music and architecture, the later name of which is the *Académie des Beaux Arts.* At present the Institute is made up of five distinct academies, each having its own officers, meetings and publications. The *Académie Française*, whose origin has been stated, is the first. Its department is the French language and literature, and its ordinary members number 40. The *Académie des Inscriptions et Belles-Lettres* comes next, having 40 ordinary, 10 honorary and 100 corresponding members. The *Académie des Sciences*, which has 65 ordinary, 10 honorary, 8 foreign and 100 corresponding members, is third; and the *Académie des Beaux Arts* is fourth. This has 40 ordinary, 10 honorary, 10 foreign associate and 40 corresponding members. It distributes prizes. The *Académie des Sciences Morales et Politiques* is the last. This has 40 ordinary, 6 honorary, 6 foreign associate and 40 corresponding members. Salaries are attached to memberships. There is a fine library.

Insur′ance. The two chief kinds of insurance are that relating to property—fire and marine; and that relating to the person—life and accident. Under its contract (called the policy) the insuring company agrees, in case of property insurance, upon payment of an annual premium by the insured, to repay any loss sustained up to the amount of the insurance, unless the loss is deliberately caused by the insured. In life and accident insurance a fixed sum is paid to the person for whose benefit the insurance is taken out. Other losses and accidents against which insurance is issued, include: Plate glass fractures, steam boiler explosions, burglary and damage to crops by hail or tornadoes. Insurance companies also, for an agreed premium, go upon the bonds of employes and insure titles to property.

An interesting form of insurance is that against sickness and unemployment of which the Lloyd-George (*q. v.*) measure passed in 1911 is a striking example. To the unemployment fund provided by the act workingmen and their employers each contribute 2½d weekly, the state adding an amount equal to ⅓ of their aggregate contribution. For national health purposes, male employes contribute 4d, female 3d. For each employe the state adds 2d weekly. Employers pay the employes' contributions, deducting them from wages. The benefits include: Medical, sanitarium, sickness varying from 10s to 6s weekly for 26 weeks, disablement and maternity.

Integ′ument (in plants). A special envelope developed about the ovule of seed-plants. There may be one integument or two. In either case the integument is not distinct about the whole ovule, but only in its upper portion. At the apex of the ovule the integument or integuments leave a small passage-way, known as the "micropyle," which is for the passage of the pollen-tube on its way to the nucellus, the interior and essential part of the ovule within the integuments. It is in the integument tissue that the hard coat or "testa" of the seed develops after fertilization. See OVULE.

In′tercolo′nial Rail′way, The, is a government property. An all-Canadian system, it is the only all-rail line from Montreal to the extreme points of the maritime provinces, and (with the Prince Edward Island Railway) embraces nearly 1,700 miles of well-built road with excellent rail and steamer connections. It traverses an inviting tourist country, and reaches Quebec, Rivière du Loup and Cacouna. The general offices are at Moncton, 186 miles from Halifax. It runs to St. Johns, the capital of New Brunswick and 89 miles west of Moncton. It enters Nova Scotia and serves Halifax, Truro, Pictou, New Glasgow and other important points. It was one of the main links in effecting federation.

In′terest. When any special sort of activity engages our attention so that we are, as it were, compelled to take part in it, it is said to be interesting. Interest involves feeling (*q. v.*), and is based primarily upon the native instincts of the person. As the expression of the supposed natural man, interest has been looked upon with suspicion by those moralists who regard the aim of life as the control or suppression of the native desires for the sake of some higher ideal of duty. Mankind very early in the history of civilization comes to regard as one of the principal aims of education the suppression of the natural cowardice and selfishness of the individual and the substitution of courage and self-sacrifice for the sake of the community. Discipline is the aim of the savage who cruelly tattoos his person with tribal emblems to show his fortitude and devotion to his people and of the more modern Puritan schoolmaster who believes that to spare the rod is to spoil the child. It is by discipline that the natural man is conceived to be made into a civilized man. According to the Christian ascetics, it is by discipline that the mortal body is conquered by the immortal spirit and the original sin of natural desire eradicated to make way for self-abnegation, submission to the will of God.

Against this time-honored view Rousseau set himself. He declared that the natural man is better than the artificial product of the training of society. He saw in the discipline of social education, not the benevolence of God, but the tyranny of man. God, he conceived, created the natural man, whom scheming priest and noble strive to reduce to slavish submission by a cruel and debasing education. The true divine plan is to let nature take its course, and true education is based on the interests of the child.

But inspiring and revolutionary as were the ideas of Rousseau, his educational scheme was in itself quite as one-sided as the one he strove to replace. For the natural impulses, unless they are organized and brought under control, leave the individual a prey to the inclination of the moment. His mental life is anarchy and not an expression of character. Rousseau assumes that self-control will naturally spring up, but he does not sufficiently emphasize its importance. Kant, the German philosopher, represents a reaction. While he agrees with Rousseau that the rod of the schoolmaster, instead of creating free and noble character, simply terrifies the child into slavery, he maintains that character means control of natural inclinations and interests. One who gives up his natural desires because of fear of social consequences is simply substituting one interest for another. The truly free man is one who governs himself by an inborn idea of duty without any reference to interests or consequences. This ideal the schoolmaster can not create by education or discipline. Hence in the long run Kant agrees with Rousseau that in reference to the highest result, character, education can do no better than to let the child alone.

This view rouses in Herbart intense opposition. He maintains that character does not consist in doing the right instead of the interesting, but rather in being interested in doing the right. He declares that self-control does not mean the imposition of an independent ideal of virtue upon natural inclinations. On the contrary, it consists in an organization and harmonizing of these interests through the discovery of their interrelation and interdependence. Moreover, he accounts for the interests from the experience that education gives the child. We become interested in things because we know something about them. The problem of the teacher is to present such a variety of experience that all the interests, sympathetic as well as individual, esthetic and religious as well as scientific, shall be developed. Then true self-government will appear in a democracy of desires, each sharing in governing and being governed; and not in a tyranny of uninteresting duty.

The influence of Rousseau, Herbart, Froebel and others has been powerfully felt in modern education. Teachers of ability have everywhere striven to make their schoolwork spring out of the interests of children, or, at least, fasten upon them. They have tried to make education interesting. The result has been what the surviving advocates of discipline and effort stigmatize as "soft pedagogy." Pupils, they say, are no longer trained to have the strength of will to do the hard and uninteresting work of life. They are left by the school weak and flabby, demanding continual entertainment and capable of doing only that which appeals to their inclinations. This criticism Professor Dewey declares to be justified, not as directed against the importance of interest, but as against an imperfect application of the idea to practice. He agrees with Kant and the disciplinarians that will and character consist in power to do difficult things. But he also agrees with Herbart that no one ever can or will do a difficult thing unless he be interested in it. Here, however, Professor Dewey makes his own contribution to the discussion. To be interested in a thing, he says, means not to find it easy, as "soft pedagogy" assumes. Nor does it mean simply to know something about it, as Herbart seems to think. Teaching means more than presenting material to the mind. It means rousing interest in that material by showing it to be *worth while.* Then and only then will effort be put forth and will be developed. Character means a trained sense of value as well as power of sustained effort. See APPERCEPTION, FEELING, CHILD-STUDY and SELF-ACTIVITY. Consult McMurry's *General Method* and De Garmo's *Interest in Education.* E. N. HENDERSON.

In'terfer'ence, a term employed in physics, especially in the study of wave-motion, to denote the combination of two or more wave-motions at any point If two waves of equal amplitude reach any point in opposite phases, that is, if the crest of one wave meets the trough of the other, they just counteract one another. Such a pair of waves are said to *interfere.* Since they completely annul one another, the interference is said to be *destructive.* In this manner two sound-waves may be added together and thereby produce silence; and two light-waves may be easily added together to produce darkness. For details of these experiments see any good text-book of physics. But two waves may meet in the same phase; and, if they have equal amplitudes, the resultant wave will have twice the amplitude of either of its components. This is also called interference. Indeed, when waves of any amplitude combine in any phase whatever, the process is called interference. A superb illustration of interference is met with in the spring and neap tides. At any one port the tide due to the moon and that due to the sun are always combining to produce the actual tide; but when they meet in opposite phases, that is, when the solar high tide occurs at the same instant as the lunar low tide, we have the *neap tide* as the result of interference. But when the solar high tide coincides in time with the lunar high tide, we have the *spring tide,* as the result of interference. For a history of this subject, as employed in light, see *Wave-Theory of Light* in Harper's Scientific Memoirs.

Interlaken (*ĭn'ter-lä'ken*) (between the lakes) a village of Switzerland, in the beautiful valley of the Aar, between Lakes Thun and Brienz. It is a favorite resort for tourists, 24,000 to 35,000 in number yearly, and contains many inns and hotels. It is from here that the tour is made for reaching many of the most wonderful scenes of nature in the region. Near by are many of the celebrated glaciers of the Alps. The village was founded by Augustine monks in 1130. Its population is about 3,000.

In'terna'tional Date Line. Places on different longitudes have different times, if the time is counted from the arrival of the sun at its zenith or highest point. Every nation, therefore, has a time of its own. usually taken from the moment when the sun is at its zenith over the capital city. But it is necessary that there be one time which shall be accepted by all nations, especially for the use of sailors. This international time is taken from the time of Greenwich Observatory, near London, which is at 0° longitude. On the opposite side of the earth, at 180° longitude, is the international date line. A person going *east* from Greenwich, round the world, moves towards the sun, and every day he sees the sun a little earlier than the day before. If he went round the earth, he would thus gain 24 hours, and, unless he corrected his date somewhere, he would be one day ahead of Greenwich. Now, it is arranged to correct such an error at the international date line in the same way as we correct our watches when we pass certain imaginary lines on the surface of the United States, so that they may agree with the time of the places to which we come. Thus, a person going *west* round the world would lose a day from the year, because his movement makes each day longer. Hence, if he gets to 180° at 3 P. M., Wednesday, according to the time of the places he has just left, he must now call it 3 P. M., Thursday, so as to agree with the places that he is just about to visit. In the north the date line is swerved a little to the west, to include the Aleutian Islands with the rest of the United States; while in the far south it swerves to the east, to include some British islands with the rest of Australasia.

International Law is the name given to the rules which govern either the actions of states in their relation to each other or the relations of citizens of different countries. It is a system created by civilized countries during the last three centuries, and its rules are now in use only among civilized peoples. The increasing intercourse between individuals of different nations by commerce and travel gives a growing importance to the interests affected by this branch of law. Each state may establish, alter or abolish its own constitution; discover and settle new countries; extend its navigation or fisheries; improve its revenues, arts, agriculture and commerce; and develop its national resources by all beneficial and lawful means. In order to do this, the attitude of states to one another must be one of mutual confidence. See *International Law* by Woolsey.

In'terno'de. In seed plants and also in some fern plants the stem exhibits a series of definite joints, at which points the leaves or branches arise. The joints are called the "nodes," and the more or less elongated portions of the stem which separate the nodes from one another are called the internodes. The length of the internodes determines the distance apart of the leaves, and therefore the growth of internodes is an important factor in the life relations of leaves.

In'tersta'te Com'merce Commis'sion, The, of the U. S., is a body of five members chosen according to the provisions of the interstate commerce act of 1887, with powers to regulate railroad rates, to establish uniform rates, to insist upon the publication of accounts and to inquire into infringements of the act. The Constitution vests the power "to regulate commerce . . . among the several states" in Congress, and the Interstate Commerce Commission has been very efficient in preparing statistics of railroad rates, in leading up to the enforcement of state regulations of these rates and in hindering unjust discriminations against certain parties. It was largely through the Interstate Commerce Commission that the new rate bill of 1907 was brought forward by President Roosevelt's administration. The weak point in the powers of the Interstate Commerce Commission was that it had not been able to enforce its injunctions. This led to the passage in 1906 of a law increasing the powers of the commission.

Inven'tions. In the strict use of this word, to which we shall keep, an invention is a mechanical contrivance discovered through which we may realize our purpose more readily than before. The history of inventions is more important than that of wars. There is first the prehistoric age, when man invented the following instruments of his will: Speech, if we may call that an invention; fire, with the arts of heating, lighting and cooking; tools, the axe, the knife, the plough and such weapons as the bow, the sword and the lance; the means of selecting and improving grains and fruits; the taming and training of domestic animals; the making of pottery; of simple clothes; and of musical instruments; the building of tents and houses of wood or stone; wheeled carts and sleighs, boats, to row and to sail. These are prehistoric inventions, which are found in many parts of the world. In some regions the following inventions had been made before the dawn of history: the smelting, working and hardening of metals, irrigation through dams and canals, waterwheels, glass, bricks, various ways of measuring and, finally, writing, with the making of paper, etc. With the last invention history, of course, begins.

It is remarkable that, when men had learned to write, for thousands of years they practically ceased to invent. Between 4,000 B. C. and 1100 A. D. no invention was made equal in importance to the above, but only improvements in minor details. Ships were made larger, clothes were made richer, but the real activity of man was directed towards the things that writing made possible, viz.: society, based on written law, literature, history, science and philosophy. Writing thus made it possible to build up great fortunes, to found permanent empires and to devote the lifetime of gifted men to the fine arts.

The third period in the history of inventions begins with the invention of the compass by European nations about 1200 A. D., of gunpowder about the same time and of printing about 1450. These had been invented in China long before, but the west discovered them independently and made great use of them, to discover America, to shatter feudalism and to reform the church and free men's minds. Since then the great inventions are the pendulum clock by Huyghens (1657), the steam engine by Watts (1769), the electric motor and dynamo by Faraday (1832), gas lighting by Murdock (1792), vaccination by Jenner (1796), the electric light by Davy (1870), the telephone by Bell (1876), the reaping machine by McCormick (1832), the photograph by Daguerre (1839) and spinning machines by Paul (1738). Other inventions that struck out a new line were those of the microscope and telescope, the application of chemical analysis to every branch of manufacture, the production of steel by cheap processes and the means of making exact measurements. But it is hard to identify these with any one man or time.

The development of these fundamental inventions covers every field of modern life. The compound and turbine engine, applied to railroads and to ships, gasoline engines, screw ships of iron and steel, oil and sugar refining, matches, the cottongin, the circular saw, spring clocks, aniline dyes, spectacles, antiseptics, various serums for inoculation, galvanized iron, paper from wood pulp, machines for every purpose from the making of pins to the making of armor plate, the phonograph the kinetoscope,—the list is endless and is ever growing. The study or the history of inventions is one of the best ways to understand modern life.

Invest′ments. The money which is saved by individuals is generally *invested* in some enterprise by which it may at the same time be of some service and yield an increased return. The most common investment is in the banks; but in such a case it is not really the depositor but the banking company which makes the investment. The interest which the bank pays to the depositor is only a part of the return which the bank gains from its investments. These investments may be in such securities as house and land property; or in such industries as mining, railroads or manufactures. It is seldom that a private individual, except in the case of house and land property, controls the whole of the concern in which his money is invested. For the most part he buys some shares in such a concern. Most great railroad and mining companies and many manufacturing establishments are organized into joint-stock companies, from which one receives *dividends* or periodical payments out of the profits, if any, in proportion to the number of shares which one may hold. The *stock* of such companies is sometimes bought merely in the hope of selling at a profit if it should rise in value. This kind of speculation is not worthy of the name of investment. Probably the first and safest investment in most cases is one's own house and land.

In′volu′cre (in plants). A set of bracts occurring in a rosette ("whorl," "cycle"). Bracts are leaves more or less modified, which occur in an inflorescence. In some forms of inflorescence, as in the umbel and head, the numerous pedicels arise from approximately the same point, and as each pedicel is subtended by a bract, the numerous bracts are thrown together in a rosette-like cluster which is called the involucre. A distinct involucre is present, therefore, in the head-like clusters of the composite family, in which case it resembles the calyx of an ordinary flower, and also in the umbels of the great family of umbelliferæ, to which the carrots, parsnips etc. belong.

Io (*ī′ō*), a character in Grecian mythology, was the daughter of Inachus, king of Argos. She was beautiful, and soon won the love of Jupiter, the Grecian god of the sky, who on account of the jealousy of Juno, his wife, changed Io into a white heifer. Juno appointed Argus, "the all-seeing one," who had one hundred eyes, to watch over her. Mercury, the winged god, was commissioned by Jove to carry off the heifer, and he slew Argus, first charming him to sleep by playing on the flute and then cutting off his head. Juno used the eyes of Argus to decorate the peacock's tail. Afterwards, by the request of Jupiter, Io was restored to her former shape, and married King Osiris. After her death she was worshiped as an Egyptian deity, under the name of Isis. The story is given in the *Prometheus* of Æschylus.

I′odine, one of the nonmetallic elements, is a black crystalline solid. It is never found in the free state, but occurs in combination, particularly in the ashes of seaweeds and in Chilean saltpeter. It forms a beautiful violet vapor when heated; hence its name comes from a Greek word which signifies this color. Iodine and its compounds, the most important of which is potassium iodide, are used in medicine and photography and by chemists.

Iona (*ēō′nä*), the most famous island of the Hebrides off Scotland. It is three and one half miles long and one and one half broad. The soil is fruitful, so much being raised per acre that in early times the yield was considered miraculous. Its history begins in 563, when St. Columba, leaving Ireland, landed upon Iona with 12 disciples and built a monastery, which was long regarded as the mother-church of the Picts. The heathen Norsemen ravaged and destroyed the settlement repeatedly. In 1888 a great Catholic pilgrimage was made to the island. It is situated near Staffa, and can be reached by steamer from Oban. See *Iona* by the Duke of Argyll.

Io′nian Islands, a group or chain of islands in the Ionian Sea, about 40 in number, stretching along the west and south coasts of Greece. Corfu, Paxo, Santa Maura and Ithaca are the largest. Their total area is 1,010 square miles, and the population 260,000, mostly of Greek descent. The surface is generally mountainous, and the plains and valleys fertile. In 1863 Great Britain ceded the islands to Greece. See CORFU.

Io′nian Sea, a name anciently given to that part of the Mediterranean which washes the shores of Greece and Epirus, separating them from Italy and Sicily. It is connected with the Adriatic by the Strait of Otranto.

Iowa (*ī′ôwȧ*), the "Hawkeye State," one of the north-central states, is bounded on the north by Minnesota, on the east by Wisconsin and Illinois, on the south by Missouri and on the west by Nebraska and South Dakota. It is rectangular in shape; 310 miles east and west and 205 north and south; has an area of 56,025 square miles; the Mississippi flows along the eastern border and the Missouri and Big Horn along the western one. Des Moines, the largest city and capital, has a population of 86,368. The state's population is 2,224,771.

Surface. Iowa, lying in the great central plateau, is distinctively a prairie state. The surface is gently rolling, except on the eastern and western borders where erosion has formed hills and bluffs. In the southern part, also, the same cause has produced hills grouped in series forming ridges having a general north and south direction parallel to the streams. From the highest point, Wanita, O'Brien County (1,562 feet), the plateau slopes gently to the south and southeast, the lowest point being in the southeastern part of the state (400 feet).

Drainage. The watershed extends across the state parallel to the Missouri River, forming two hydrographic systems — the Mississippi draining the eastern two thirds and the western draining the western third. Of the former, the most important rivers are the Des Moines, which is the longest and most important, Cedar, Iowa, Skunk, Wapsipinican and Turkey; of the Missouri system the Big Sioux, Little Sioux, Nishnabotna and Nodaway may be named. Those of the Mississippi system flow southeast, those of the Missouri system to the southwest.

In the northern part are numerous, clear, pebbly lakes in glacier-scored beds. The most important of these are Spirit Lake, the two Okoboji Lakes and Clear Lake, all popular summer resorts.

Soil. Over the entire area of the state, except in the extreme northeastern portion, is a deposit of glacial drift consisting of fine rock and fragments varying from a few inches to hundreds of feet in depth. This covering gives the state an unusual variety of fertile soils. There are three distinct kinds: alluvial, consisting of recent deposits, the principal tract being the Missouri bottoms, very fertile; glacial drift, a fine clay and sand loam, also very fertile, covering the greater part of the state; and loess, a fine yellowish sand found in various parts of the state along the margin of drift areas.

Minerals and Mining. Of the mineral products, bituminous coal is the most valuable. In 1910 more than 7,928,120 tons were mined. The coal measures lie in the southern part of the state with extensions up the Des Moines and Missouri Rivers. Gypsum building stone, limestone and lead are mined in several localities. Excellent clays for the manufacture of brick and pottery abound, and give rise to important industries. The total value of the clay products in 1904 was $3,487,176.

Climate. Owing to the uniformity of surface and altitude, there is uniformity of climate. The climate is continental, with great variations in temperature between summer and winter, the extremes ranging from 40° below zero to 110° above with an average of 47.4° F. The rainfall averages 30.11 inches, two thirds of which fall during the crop months from April to October. This fact, together with the high temperature during the summer and the fertile soil, accounts for Iowa's agricultural prosperity.

Agriculture. Iowa is unsurpassed in the quality and extent of its cultivated land. In 1910 it exceeded every other state in the percent (95.3) of its land area in farms and in the percent (82.8) that was improved. Iowa ranks first of the states in the production of corn, more than one fourth of the total area being devoted to it, and its value equals that of all of the other crops. The crop of 1910 was 343,870,000 bushels. Oats, with half the acreage and one third the value, rank next. Wheat, at one time one of the most important crops of the state, was largely abandoned, but is again becoming an important crop. Other important cereals are barley, rye and buckwheat.

Large quantities of hay and forage crops are raised to meet the demands of the extensive live stock interests of the state. In the production of Irish potatoes the state ranks second, while vegetables are raised in large quantities. The production of fruit, especially of apples, is assuming an important place. Dairying and sheep-raising are also important industries, the value of dairy products alone being over $30,000,000 annually. On April 15, 1910, there were 4,448,006 head of cattle, 1,547,810 horses and mules and 7,545,853 swine in the state.

Manufactures. Iowa, with an abundant supply of fuel and good transportation facilities, sends the larger part of her farm products to other states to be manufactured. However, she has made substantial progress in many lines of manufacture, as dairy products, slaughtering and packing, milling, vehicles, food preparations, foundry and machine shops, clay products, lumber, etc. The 1910 census showed 5,528 establishments, having a capital of $171,219,000, employing 73,037 persons at an expense of $43,514,000, the value of whose products was $259,238,000.

Transportation. The Mississippi offers water transportation along the eastern border and the Missouri along the greater part of the western one. On account of its central location the state is crossed by numerous trunklines of railroad. In 1856 there were 123 miles of railroad. In 1910 there were 9,754 miles, no point in the state being more than eight miles from a railroad.

Forests. There are no great forests, the timber growing along the banks of the streams. The principal native trees are the elm, the oaks, cottonwood, walnut, hickory, maple, cedar etc.

Education. The Federal census of 1900 placed the percentage of illiteracy among persons of the ages of ten and over at 2.31

and the state census of 1905 gave the percentage of illiterates among those of five years and over as 1.5. The public schools are supported almost entirely by district taxes, the interest on the permanent school fund amounting to about 30 cents per pupil of school age. To this are added a county tax of from one to three mills and certain fines. During 1909-1910, schools were maintained in 12,503 rural and 7,164 graded rooms, in 13,896 buildings valued at $27,233,239. The number of persons of school age (5 to 21) was 677,004, of whom 510,661 were enrolled in the public schools, maintaining an average attendance of 360,178. To maintain the schools 2,689 male teachers at an average monthly salary of $72.01 and 24,909 females at $45.21 were employed. The total amount paid for school purposes was $13,711,466, of which $8,335,917 was paid for teachers' salaries. The amount of the permanent school fund in September, 1910, was $4,788,817.

History. In 1673 Marquette and Joliet and in 1680 Hennepin touched the borders of the state. In 1788 Julian Dubuque obtained from the Indians a tract of land, including the present site of Dubuque. He established a trading post and developed the lead mines. Upon his death in 1810 the settlement was abandoned. In 1803 this territory, as part of the Louisiana Purchase, became part of the United States. Until 1838 it formed part of the territories of Louisiana, Missouri, Michigan and Wisconsin in succession. On June 12, 1838, it was organized as a separate territory, and on December 28, 1846, it was admitted into the Union. Fort Madison was erected in 1808, and in 1832 immigrants settled in that vicinity and at Burlington. After the close of the Black Hawk War this territory was settled rapidly. With the revision in 1857 of the constitution of 1846, the seat of government, which had been moved from Burlington to Iowa City in 1844, was transferred to Des Moines. When the whites first entered this territory, the Sac and Fox Indians occupied the eastern and the Sioux the western portions. The remnants of the former are now maintained on their reservation near Toledo, Tama County, while the latter have entirely disappeared.

Iowa Indians, a tribe of American Indians of the Dakota family, known among themselves by the name of Paducah. In 1700 they lived on Mankato River, Minnesota, numbering about fifteen hundred, and were often at war with the Osages and other tribes. Their number has been reduced by intemperance, war and disease. The survivors, numbering only 122, are located on reservations in Kansas and Indian Territory.

Iowa River, a river of Iowa, rises near the Minnesota line; flowing southeast for 300 miles, it empties into the Mississippi. It is navigable for small vessels for 80 miles to Iowa City.

Iphigenia (*ĭf′ĭ-jē̇-nī′ȧ*), in Grecian legend, a daughter of Agamemnon and Clytemnestra or, according to others, an adopted daughter. Her father offended Diana, and vowed to make atonement by sacrificing to the goddess the most beautiful thing born within the year. It happened that this was Iphigenia. Agamemnon long delayed the payment of his vow, but at length was commanded by the seer Calchas to keep his promise. When Iphigenia was brought to the altar to be sacrificed, she disappeared, and a hind lay there in her stead, Diana herself having caught her up in a cloud and carried her to Tauris. Here she became a priestess. Her brother, Orestes, found her here and removed her to Attica. The beautiful legend has been made the subject of many Greek poems, and artists and poets have immortalized the name of Iphigenia.

Ips′wich, a river port and market town of the county of Suffolk, England, of which it is the capital. It is situated on the River Orwell, at the foot of a range of hills, 64 miles northeast of London. The streets are narrow and irregular, and some of the old houses are ornamented with curious carved work. There are large iron and soap factories, breweries, corn mills and shipbuilding docks. The exports are chiefly from these industries. It was twice pillaged by the Danes, received its charter from King John and was twice visited by the plague. Its population is 75,936.

Iquique (*ē̇-kē′-kä*), the port and capital of the Chilean territory of Tarapacá (Peruvian till 1881). It has important industries connected with the silver mines and iron mines, and exports saltpeter, borax and iodine. The climate is hot, and pure water is only obtained by distilling. Earthquakes have frequently damaged the town. Its population is 43,005.

Iranians (*ē rän′yans*) or **Persians,** a branch of the Indo-European or Aryan family. In early times they peopled the entire country of Persia or Iran, and they are believed to form the connecting link between the Aryan races of Asia and of Europe. Ther first appearance in history is as the race of the Medes, 2400 B. C. The Iranians to-day are found west of the Indus River, and include the Afghans, Tajiks, Aimags and the Persian races, Kurds and Armenians. The oldest literature is contained in the sacred books of the Parsees or fire-worshipers, called the Zend-Avesta. Modern Persian is Iranic, with a large mixture of Arabic words.

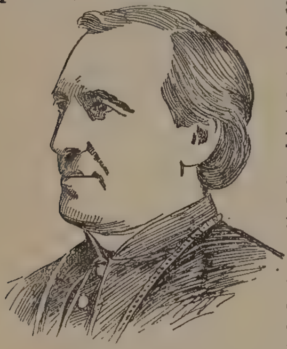
Ire′land, an island forming part of the united Kingdom of Great Britain and Ireland. It is washed on the north, west and south by the Atlantic; and on the east by a strait called at different places the North Channel, the Irish Sea and St. George's Channel. Its length is 302, its breadth 110, miles. The island was known to the Greeks as Ierne and to the Romans as Hibernia. It is divided into the four provinces of Ulster, Leinster, Munster and Connaught, which are separated into thirty-two counties. The total area is 32,605 square miles. The last census gave a population of 4,381,951, a decrease of over nine per cent. since 1881. The coasts are varied, from even and uniform on the east to rocky and uneven on the north, west and south. There are, however, numerous safe bays and excellent harbors. Dangerous headlands are pointed out to mariners by some sixty lighthouses and three floating lights. Down to the middle of the 18th century Ireland was a pastoral country. The soil, however, is in many parts adapted to agriculture. Fishing is carried on to some extent; but, the fisheries are not in a flourishing condition.

Ireland never has been a manufacturing country, though Irish linens are well-known. The exports are largely of grain, flour, butter, eggs, linen and salted meats. The climate is like that of Great Britain. The most important university is that of Dublin, with a teaching staff of 98 and 1,100 students. The history of Ireland abounds in legend and fable, showing a very ancient civilization and showing that the island was occupied by successive invaders, the Phœnicians and Greeks both taking part in its early settlement. The authentic history begins with the life and career of St. Patrick. Saint Patrick was born in Scotland, and in youth was carried as a slave to Ireland. He escaped to Rome, and rose high in the service of the church. Early in the 5th century he returned to Ireland, with the object of converting it to Christianity. He more than accomplished his holy mission, making Ireland the great missionary school from which he sent forth preachers of the faith into all Europe. The Norman invasion took place in 1167, during the reign of Henry II of England. After the conquest the king divided the island into counties, and set up the English courts in Dublin. He made huge grants of land to favorite Norman barons, to hold as they could. So began the great struggle in Ireland, which has lasted down to our own day. The struggle between Normans and Irish filled the period until, in Henry VII's reign, was passed the famous measure known as Poyning's act (1494), which declared that all English laws should have force in Ireland and that the acts of the Irish parliament should be confined to such measures as had been first approved by the king and the privy council in England.

Henry VIII confiscated the church lands in Ireland, as in England, and attempted to force the people to give up the Roman Catholic religion. The Earl of Tyrone, one of the great family of O'Neill, kept up the struggle in the reign of Elizabeth, defeating Essex but yielding to Mountjoy. The Irish rose in rebellion during the Civil War in England, but were conquered by Cromwell, their country, all but Connaught, being given to the English and Scotch settlers and the Irish being driven into Connaught. Under Charles II and James II the struggle continued; while the loyalty of the Irish to James brought upon them the vengeance of William III and the defeat of James II at the battle of the Boyne. The treaty made at the surrender at Limerick was broken, and the penal laws, as they were called, were imposed, with the object of driving Roman Catholicism from the land. The war with America gave the Irish another opportunity to claim their rights, and with Grattan and Flood as leaders they succeeded in 1782 in securing the declaration of the independence of the Irish parliament. The new leaders were Protestants, but made a strong effort to repeal the laws against the Catholics, but failed; and the failure brought on another rebellion and cruel punishment. By unscrupulous means the Irish parliament was induced to agree to the act of union by which Ireland, like Scotland, came into one parliament with England.. Since that time the names of Emmett, O'Connell and Parnell as Irish leaders and of Bright and Gladstone as English defenders of the Irish cause indicate the struggle that is still in progress.

There seems to be evidence that Ireland has of recent years made a decided advance in the direction of a better social and financial condition, to the satisfaction of its many and sincere well-wishers. This is borne out by the returns of the banking, railway, agricultural and co-operative credit associations in Ireland, which show great social improvement in the condition of the people and gratifying evidences of financial thrift in certain classes in the community. The emigration statistics, issued by the Irish registrar-general for 1900, are also significant. In the last fifty years no fewer than 4,028,589 persons of Irish birth emigrated from Ireland. The average for the first five years of that period was 149,600 annually; in the last five it was 38,058. The emigrants from Ireland in 1903 numbered 39,789, in 1904, 36,902 and in 1911, 29,112. The population of Ireland, by the new census of 1911, is ascertained to be 4,381,951, against a population in 1901 of 4,458,775—a decrease of 76,824 or 1.7 per cent. of loss against a loss of 5 per cent. in the previous decade. This shows that the emigration from Ireland has, within the period, sensibly declined. The Irish language is Gaelic, a branch of the Celtic. The capital, Dublin, had in 1911 a population of 309,272. Belfast had 385,492. Cork, Limerick, Londonderry and Wakefield were the next largest cities in population. See *English in Ireland in the Eighteenth Century* by Froude and *Outlines of Irish History* by McCarthy.

Ire'land, John, an American Catholic prelate, was born in Kilkenny Co., Ireland, Sept. 11, 1838, and came to the United States when quite young. He was ordained a priest at St. Paul, Minn., in 1861, and served as chaplain of a regiment during the Civil War. He was afterward in charge of the cathedral of St. Paul, and in 1875 was made coadjutor-bishop. He was a member of the Vatican Council of 1870, and in 1888 was made archbishop of St. Paul. Bishop Ireland has taken a deep interest in the cause of temperance and other public and social questions, and has risen to a position of commanding influence as a wise prelate and a patriotic citizen.


ARCHBISHOP IRELAND

Ire'ne, a Byzantine empress, once a poor orphan girl of Athens in Greece (born about 752), whose beauty and talents drew the attention and love of Emperor Leo IV. He married her in 769, and after his death she ruled as regent during the minority of her son, Constantine VI. She was banished to Lesbos in 802, where she died in the following year. The Greek church counts her among its saints.

Irid'ium, a metal of the platinum group and found in ores containing platinum, takes its name from its iridescent appearance. It was identified as an element in 1803–4 by Smithson Tennant. Technically, its symbol is Ir., and its atomic weight 193.5. Iridium is used to make hard tips for gold pens, for the vents of cannon and even for surgical instruments. It resists the attacks of the atmosphere and even of the mineral acids; but this useful property makes its separation a difficult process. It makes a valuable alloy with platinum, giving an unrivalled elasticity and durability to this metal, as in the case of the rod deposited in Paris as the standard meter, which is one tenth iridium and nine tenths platinum.

I'ris, a genus of plants which gives name to the iris family, and containing about 170 species, which are natives chiefly of the north temperate regions. About 20 species are native to North America, and over 100 species, with innumerable garden forms are to be found in the trade catalogues in America. The irises have a general lily-like appearance, but are readily distinguished from true lilies by their inferior ovary and by their more or less irregular and more complex flowers. Prominent groups in cultivation are (1) the German iris or *fleur-de-lis*, consisting of varieties and hybrids of several species and exhibiting great diversity of color, ranging from pure white through all shades of blue to dark purple, and also with numerous handsome yellow-flowered varieties; (2) the Japan iris, including various forms derived from *I. kaempferi;* (3) the dwarf iris, containing several low species that spread rapidly and form large patches, making them useful as border plants. The *fleur-de-lis* is the national emblem of France; as early as the days of Charles I it appeared on the banners of France. Our common native forms are better known as "flags," most common among which are the large blue flag (*I. versicolor*) and the slender blue flag (*I. prismatica*).

YELLOW IRIS
(*a*) Capsule with Seeds.

I'rish Sea. The body of water which lies north of Wales, west of England, south of Scotland, east of Ireland. In it are the islands of Man and Anglesea.

Irkutsk (*ĭr-kŏŏtsk'*), the capital of a province of eastern Siberia of the same name and the residence of the governor-general of eastern Siberia. It is the best built town in Siberia, with straight, wide streets and handsome public buildings, a cathedral, public library and museum. It is the commercial center of Siberia, especially for the tea trade, as it is on the great Siberian highway from Russia to China. It was founded by a Cossack chief in 1652. Population 51,473. See *Century Magazine* for February, 1889. The province has an area of 280,429 square miles and a population of only 674,900.

I'ron, a metal in very common use, and in some of its combinations is found in large quantities, though native iron is very rare. The compounds of iron are found everywhere in the rocks and soil, and to these compounds the red color of rocks, soils, bricks etc. is due. Plants and animals cannot exist without iron, for it is a constituent of the green coloring matter of leaves and the red blood corpuscless. The iron used in trade is more or less impure, often containing carbon, silicon, sulphur and phosphorus. "Pig" iron or cast iron has the most impurities, while wrought iron has the least and is almost pure iron. Steel is intermediate between cast and wrought iron in the amount of foreign matter that it contains. Iron ore, the shape in which iron is found, is abundant and widely distributed. The magnetic ore is the richest, and is found in dark, heavy masses of black crystals. The red ore, brown ore and bog iron ore are other varieties. In the United States iron ore is found in large quantities and in nearly every state. The product of pig iron in the United States far exceeds that of Great Britain, being 27,303,567 long tons in 1910, against the yield in Great Britain of 10,012,098. Pennsylvania is the leading state in the manufacture of iron and steel; Ohio, Alabama and Illinois are also prominent. Tennessee, Virginia and Missouri are rich in iron ore. Iron Mountain in Missouri covers 500 acres, and has large veins of iron ore, though it is not a mountain of iron, as commonly supposed. The iron mines in the neighborhood of Lake Superior form some of the most wonderful deposits in the world. The first blast furnace was worked by William Penn in 1688, and the first rolling mill was started in 1817 at Plumstock, Pa. The best iron in Europe comes from the Dannemora mines in Sweden, which have been worked since the 15th century. Russia, England, Germany, France, Sweden, Belgium, Austria-Hungary, Canada, Spain and Norway are iron-producing countries, The total product of the chief world countries in 1910 was: Pig iron 65,860,000 metric tons; steel 58,252,000 tons; Germany produced nearly a fifth of this total. The manufacture of steel in the United States in 1910 was 26,094,919 long tons.

The manufacture of iron dates back to early periods, and, though the methods have improved, all depend upon the use of furnaces. The Romans in Britain left great heaps of cinders so imperfectly worked that they have supplied much ore for use in modern furnaces. Charcoal was used in the furnaces until 1618, when coal was first tried, but did not come into general use until 1713. In 1750 coke was introduced. The process of puddling and rolling was invented by Cort in 1784, and the use of the hot blast by Neilson in 1830. The greatest improvement of modern times is what is called the Bessemer process for making steel. (See BESSEMER.) The uses of iron are too numerous to mention, and are increasing rapidly. See *Iron, History, Properties and Processes of Manufacture* by Fairbairn; *Manufacture of Iron* by Overman; and Campbell's *Manufactures and Properties of Iron and Steel.* H. L. WELLS

Iron Age, a term indicating a degree of culture in a people, as shown by their use of iron tools or weapons. It is the latest of the ages called the Stone, Bronze and Iron Ages. But this order is not followed strictly in all parts of the world; for, as in parts of America, the natives seem to have passed from the use of stone to that of iron. When America was discovered, the Indians did not use wrought iron. In Europe the iron age began earlier in the south than in the north. Greece was entering the iron age in the time of Homer; while Scandinavia reached it about the beginning of the Christian era. The tools and weapons of the iron age differ from those of the bronze age in being hammered instead of cast into shape, and in being ornamented with curving instead of with straight lines. But the important distinction is the use of alphabetic characters, which indicate a written language.

Ironclads. See NAVY.

Iron Mask, The Man with the. The story of the prisoner, so-called, has long held its place among the most romantic stories of history. He was supposed to be the duke of Vermandois, a son of Louis XIV and Mdlle de la Vallière. Becoming angry one day, he boxed the ear of his half-brother, the dauphin. For this offense he was imprisoned for life. Voltaire, in his history of Louis XIV, speaks of the young prince as a noble-looking figure, who, in being led from one prison to another, wore an iron mask concealing his face. He was at last transferred to the Bastille, where he was treated with great distinction. He died in 1703. Other theories make this French state prisoner the brother of Louis XIV. See *Age of Louis XIV* by Voltaire.

Iron Mountain. A famous deposit of iron ore gives the name of this mountain, which is situated in St. François County, Mo. The ore is rich and yields 68 per cent. of iron. It is magnetic, and in some places acts strongly on the needle. Its main body has a thickness of 50 feet. Since 1845 over 5,000,000 tons have been shipped.

Iron Mountain, Mich., a city and the county-seat of Dickinson County, is about 57 miles west of Escanaba. Its trade is principally in iron ore and farm products, for the city is in the vicinity of iron mines and Wisconsin farms. It is served by the Chicago, Milwaukee and St. Paul and Chicago and Northwestern railways. Population 9,216.

Ironton, the county-seat of Lawrence County, O., on the Ohio River, 142 miles above Cincinnati. It is the chief business center of an important iron region, which gives employment to numerous furnaces, foundries and other manufactories. The brick and clay industries are quite extensive, and two immense cement plants are located here. Population 13,147.

Ironwood, Mich., a city in Gogebic County, about 33 miles from Ashland, Wis. In the vicinity there are much timber and iron ore, and the section is known as the Gogebic iron region. Gogebic has a city hall, a Carnegie library, a high-school and several churches. It is served by the Wisconsin Central and Chicago and Northwestern railways, and has trolley connection with Gile and Hurley, Wis. Population 12,821.

Iroquois (*īr′ō̇-kwoi′*) **Indians,** formerly a great union of Indian tribes, recognized as a distinct branch of the Algonquin family and occupying central New York. In the 17th century they were known as the Five Nations. In 1715 they were joined by the Tuscaroras, when their name was changed to the Six Nations. They never exceeded 15,000 in number, and they still number about 12,000, most of them being in the United States, though some of the tribe are found in Canada. Schools and missions have been established among them, and some of their number have reached distinction as soldiers, engineers etc. Cornplanter, Brant and Red Jacket were Iroquois. See *Brant and Red Jacket* by Eggleston and *The Iroquois* by Johnson, also by Morgan.

Irawadi (*ĭr′ä-wä′dĭ*) (said to mean, like Mississippi, the father of waters), is the great river of Farther India. Its course is nearly due south, and its length is about 1,000 miles. It is superior to the Ganges and Indus for navigation, vessels ascending nearly 800 miles from its mouth. It crosses Burma and enters China on the southwest. In both the Burmese wars it was the chief means of advance for the English armies.

Ir′riga′tion is the artificial application of water to land. Ruins of basins, acqueducts and canals give ample evidence of its extensive use in pre-historic times. Irrigation was practiced among the Assyrians, Babylonians and Phoenicians and China, Egypt and India are noted for the antiquity and the completeness of their systems. Remains of works in Colorado, Utah, New Mexico and Arizona show that the pre-historic inhabitants practiced irrigation and some of their ditches are used in present operations. The Mormons furnished the United States with the first irrigation on a practical scale. In California it was developed in connection with mining. The Union Colony established in Colorado in 1870 made the Greeley District famous for its productions, especially potatoes and alfalfa.

The Spaniards who invaded the country learned irrigation and carried it to their kinsmen in Mexico. In southern California the early missions surrounded their stations with farms made fruitful by watering the parched plains. The wonderful results of these later-day ventures induced the adoption of systems of irrigation in other portions of the regions of insufficient rainfall, and this was largely done by forming colonies, their settlers locating on small, near-by farms and obtaining water from a common source. In this manner increasing areas were brought under cultivation, and such colonies, with individuals, associations and companies, introduced irrigation in many localities. In the 80s millions of money was put into such projects speculatively, but few proved profitable for investors, although they were the means of substantial advancement in extension of irrigation.

Government Reclamation Projects. The whole scheme, however, has become so vast and of such economic importance that state and national governments are more and more assuming its responsibilities. The reclamation act, which became a law in 1902 marked the beginning of a new era in irrigation in America. This provides that the proceeds from the sales of public lands in 13 states and three territories be used in constructing irrigation systems therein. Any lands thus reclaimed are subject to entry only under the provisions of the homestead laws in tracts of not less than 10 nor more than 160 acres, and between these limits the acreage may be restricted by the Secretary of the Interior as his judgment dictates. The settlers are required to pay, in not to exceed ten yearly installments, such amounts per acre as may be equitably apportioned—which in the case of the initial system put in operation was $26—with a view to returning to the reclamation fund the estimated cost of the construction of the projects, which in effect gives free land under the homestead laws and permanent irrigation systems and water at cost, although the title to the sources of supply remains in the government until otherwise provided by Congress. When the payments are made for the major portion of the lands irrigated, the control of the works passes to the owners of the land, to be maintained at their expense under such form of organization and under such rules and regulations as may be acceptable to the Secretary of the Interior. Under this act much work is being accomplished and stupendous schemes undertaken. Extensive engineering projects are under way in several of the states and territories affected by this act, which applies to Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming. The projects already authorized contemplate the ultimate redemption of 2,000,000 acres.

In 1913 water was available from the Government irrigation systems for 1,290,107 acres, and 942,272 acres were under contract to receive water. Conservative engineers estimate that there are 30,000,000 acres of our desert which may be reclaimed.

The Salt River project in Arizona is one of the best known of the Government irrigation projects. Its principal structure is the Roosevelt dam, 280 feet high and 1,125 feet long on top. The storage capacity of the reservoir created by this dam is 1,284,000 acre-feet, or sufficient to cover 1,284,000 acres one foot deep. It supplies water to about 190,000 acres of land in the vicinity of Phoenix, and power created at the dam site is transmitted electrically about 100 miles down the valley to pump water to additional areas.

Gunnison Tunnel, a six-mile bore through the Vernal Mesa in Colorado; Shoshone dam, 328 feet high, in northern Wyoming; and Laguna dam, a weir nearly a mile long across the Colorado River 12 miles above Yuma, Arizona, are other notable engineering works of the Service. A unique pumping project has been built in western North Dakota, where the pumps are placed on floating barges which accommodate themselves to changes in the river banks and in the water level. The pumps force water through pipes with flexible joints to settling basins on the shore. Power is generated with lignite mined from a Government coal mine in the vicinity.

Two of the largest structures erected by the Reclamation Service are under construction at the present time, the Elephant Butte dam near Engle, New Mexico, and the Arrowrock Dam in southern Idaho. The Elephant Butte Dam will be 290 feet high and 1,200 feet long on top. The reservoir created by this dam will have a superficial area of 40,080 acres, and a capacity of 2,627,700 acre-feet. It will serve a double purpose in protecting the lower valley from destructive floods and insuring an ample water supply for 180,000 acres of land in New Mexico, Texas and Mexico. The Arrowrock dam in Boise River canyon will be 350 feet high, and its cubical contents will be about 500,000 cubic yards. Its purpose is to store the flood and excess waters for the irrigation of about 200,000 acres of land in the vicinity of Boise.

A brief summary of the work of the Service shows that it has built 7,961 miles of canals and ditches, 401,000 feet of flumes, 120,000 feet of culverts, and 831,000 feet of pipe lines; its excavations amount to more than 99,000,000 cubic yards; it has built 697 miles of wagon roads and 51 miles of railroad, and has in operation 2,331 miles of telephone lines; it has developed 32,466 horsepower, and built 351 miles of electric transmission lines. Its tunnels have a length of over 22 miles, its canal structures number 50,233, and it has built 3,339 bridges, and 82 miles of dikes. The capacity of its reservoirs amount to 5,051,210 acre-feet.

As a result of this work it is estimated that 100,000 people are already established in homes on the Government projects. Flowing out of the engineering activities are countless beneficial factors which are tending to eliminate isolation, to promote betterment of social and educational conditions, and to dignify agriculture as a profession. Centralized graded schools, trolley lines in the farming sections, country clubs and assembly halls, churches and organizations for producing and marketing products, co-operative creameries, canneries, laundries, etc., are among the numerous agencies being developed to make rural life attractive and complete.

The government aid is not intended to discourage or interfere with a continuance of private enterprise, and the government is supposed to enter only fields where private capital is not strong enough to develop the opportunities properly or where, if left to individuals, the possibilities would be only partly utilized.

Engineering skill has performed wonders in irrigation construction; great dams and reservoirs have been built, mountains tunneled, canyons spanned depressions bridged, rivers diverted, and waters conducted in devious ways for long distances and by these means and by canals been made available to the land. Naturally irrigation has been most associated with arid regions; but when pursued in many of the more humid sections, results have been obtained that proclaim its widespread beneficence.

Storage Reservoirs. The storage reservoir has come to be an essential part of irrigation schemes, and water for this purpose is mostly obtained from streams having their sources in the forests and melting snows of the mountains. In the springtime and early summer these streams are converted into swollen torrents, and in the earlier years their waters hurried to the oceans, unused, but they are being more and more diverted and stored to reclaim the dry lands The early systems depended mostly upon the natural flow of the streams for water-supply, diverted by dams and canals, but in the growing season the streams were lowest, and, when water was most needed, it often was not available. This condition resulted in the extensive building of dams and storage reservoirs, in which are collected the flood-waters, thus not only insuring a supply when most needed but making possible the reclamation of vast additional areas hitherto accounted worthless. From these artificial lakes and reservoirs the waters are conducted into main canals and thence through lateral channels to the farms. A feature of the great enterprises undertaken by the government is the erection of works to collect and store these immeasurable flood-waters, making them available for distribution as needed. At the time of the passage of the reclamation act, however, irrigation systems had already been built along nearly every stream in the arid states, and works of considerable magnitude constructed for the storage of floods and the diversion of rivers, irrigating in the aggregate over 7,500,000 acres.

It is estimated that 90 per cent. or more of the irrigated land in the United States is supplied, mostly by gravity, with water from surface streams. The application of water is mostly done by flooding, by furrows and by subirrigation, and for best results skill and judgment are required as to how, when and in what quantities it should be used, which is governed largely by the quality of the soil and the kind of crops raised.

California leads in the number of irrigators and the value of produce from irrigated land, although Colorado has the greatest irrigated area. Of the annual productions on the irrigated farms of the United States forage-crops constitute over one third of the total. Fruits and vegetables are important items, largely grown in favoring localities for winter marketing. The benefits of irrigation are seen in such yields as ten tons per acre of alfalfa per season, five tons of clovers and timothy or the 400 to 500 bushels of Irish potatoes per acre, with the element of uncertainty as to moisture supply practically eliminated. Unless, however, scientific cultivation is given, the best results are not obtained, which applies equally where irrigation is not practiced; and after a field has been watered, following proper cultivation, the top soil should be stirred to aerate the ground and provide a loose, finely pulverized surface, by which excessive evaporation is prevented.

Dry Farming. In this the same principles are involved as in the so-called dry farming so widely exploited in recent years; but these principles are as old as they are excellent and simply mean good tillage, the mode of procedure depending on the requirements of the soils, seasons, climates and crops. It contemplates cultivation of the ground in such manner and at such intervals as will best improve its physical condition and prepare it for the reception and retention of the natural precipitation. By maintaining the surface soil in a proper condition capillary attraction with the moisture beneath is broken, lessening the loss of water — in short such methods of tillage as best promote rapid percolation into and prevent evaporation out of the soil. The conclusions from experiments made in Utah by the United States government are that "under such conditions, with a rainfall averaging 12 inches per annum, dry farming is feasible," although it is claimed that good results have not been infrequent where the precipitation has been even less. Its value is manifest and important to the husbandmen of the semiarid region where irrigation is impracticable or impossible, as with the natural rainfall profitable yields are obtained that otherwise have been impossible, and its increasing adoption is proving most beneficial. Its general principles mean much to every farming community, but are vital to the agriculture of regions deficient in rainfall.

The following table shows the areas of the Government irrigation projects and the expenditures to December 31, 1913:

Location	Project	Area Acres	Expenditures Dollars
Arizona	Salt River	230,000	10,500,000
Arizona-Cal.	Yuma	131,000	6,500,000
California	Orland	14,300	584,300
Colorado	Grand Valley	53,000	575,000
Colorado	Uncompahgre Vy	140,000	5,250,000
Idaho	Boise	207,000	8,500,000
Idaho	Minidoka	118,000	4,910,000
Montana	Huntley	32,400	1,193,000
Montana	Milk River	200,000	1,980,000
Montana	Sun River	200,000	1,180,000
Montana-N.D.	L. Yellowstone	60,100	3,145,200
Nebr.-Wyo.	North Platte	129,200	6,100,000
Nevada	Truckee-Carson	206,000	5,350,000
New Mexico	Carlbad	20,277	854,000
New Mexico	Hondo	10,000	360,000
New Mexico-Texas	Rio Grande	*156,000	2,850,000
North Dakota	N. Dak. Pumping	26,182	927,000
Oregon	Umatilla	25,000	1.565,000
Oregon-Cal.	Klamath	70,700	2 380,000
South Dakota	Belle Fourche	100,000	3,192,800
Utah	Strawberry Valley	60,000	2,317,000
Washington	Okanogan	10,000	614,000
Washington	Yakima**	134,000	6.596,000
Wyoming	Shoshone	164,000	4,116,500
	Total	2,496,159	81,529,800

Note:
*Rio Grande 25,000 acres additional in Mexico.
**Yakima: Sunnyside Unit 100,000 acres: Tieton Unit 34,000 acres.

During the early history of irrigation, farmers naturally confined their efforts mainly to diverting small streams in small valleys if the slope of the country and the topography were such as to make the work easy and cheap. With the values of land then existing no expensive developments were practicable.

The accumulation of alkali on the surface of irrigated lands, which was at first thought a serious detriment, is remedied by underdrainage, and, strange as it may seem to the uninformed, tile drainage appears likely to become not uncommon in many irrigated districts. In fact, irrigation and drainage go hand in hand, and most of the government's irrigation projects provide for elaborate drainage systems. It is anticipated that the advocates of national drainage works for the reclamation of the vast swampland areas of the United States will look to Congress and the Reclamation Bureau to extend the service to include the reclamation of these areas.

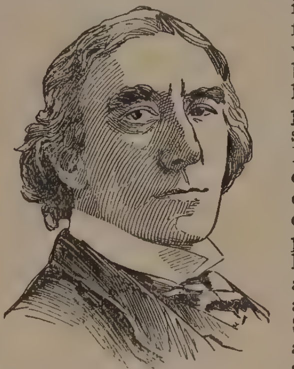
In the arid regions there are yet millions of acres that lack only water to make them productive, already possessing, as they do, the other elements of fruitfulness. In the United States prior to 1870 probably less than 20,000 acres were irrigated; by 1880 the area was probably 50 times greater; and the 13th census showed that in 1909 there were 13,738,485 acres irrigated, representing 158,713 farms, producing crops valued at nearly $181,617,396 of which more than $175,907,232 was credited to the irrigated fields of the 11 arid states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

The various governmental projects for storing the flood-waters instituted since then, together with the numerous private enterprises, including the improvement, enlargement and extension of canals and better administration of the water supply, promise to make productive wide areas heretofore barren. F. D. Coburn.

Ir′ritabil′ity (in plants). A state or condition of protoplasm in which it undergoes a change in consequence of a change in the neighboring protoplasm or in its surroundings. The change in the surroundings is called a stimulus; the change produced in the protoplasm is called a response or reaction. In plants the reaction follows the stimulus after a perceptible time, seconds (rarely less), minutes or even hours; whereas in most animals the interval (reaction time) is much less. So slow are some plant reactions that the stimulus may cease to act long before any reaction appears. Such late reactions are known as after-effects. The energy of the reaction is often many times that of the stimulus; so, although the sequence is that of cause and effect, the stimulus merely starts the action of protoplasm, which itself is the source of the energy expended in whatever work is done. Since the protoplasm ceases to react after more or less prolonged stimulation, it is supposed that it forms some material which, decomposing under stimulation, becomes exhausted when the stimulus is frequently applied and is only formed again during a period of rest. There are many kinds of stimuli: contact, friction, stress, gravity, light, heat, electricity and chemical substances, including water and air. Only certain parts are sensitive to particular stimuli. The action of the more important stimuli is described under Chemotaxis, Chemotropism, Geotropism, Heliotropism, Hydropism, Phototaxis, Rheotropism and Thermotropism. Through the chemical stimuli, probably, one part of the protoplasm influences another. Thus the change in one region, caused by some external stimulus, may act as a stimulus on neighboring protoplasm. These reactions, however, may be unseen, and a visible change may occur only at a distance from the point where the external stimulus acted. Thus, if a leaflet of the sensitive plant be scorched, all the leaflets of that leaf or even all the leaves on the plant may change their position. In such an event the stimulus is said to be transmitted from the region where it is first applied to the region where a visible response occurs. Nothing is satisfactorily known as to the processes in such transmission. Each kind of sensitiveness exists only under conditions favorable to it; prolonged unfavorable conditions produce disease, more or less severe; if conditions unfavorable to general irritability continue too long, death ensues. Indeed Sachs says: "Life is inconceivable without irritability; the dead organism is dead simply because it has lost its irritability."

Irtish (*ĭr′tĭsh*), a river of Siberia, the chief branch of the Obi. It rises at the east end of the Altai Mountains, flows toward the northwest for a total distance of 1,620 miles and joins the Obi at Samarow. From April to November it is navigable to Lake Saison.

Irving (*ẽr′vĭng*), **Sir Henry,** a noted English actor, was born at Keinton, England, in 1838. His family name was Brodribb, but by royal license he was permitted to assume the name of Irving. He was educated at London. From an early age he displayed a strong love for the stage, and made his first appearance at Sunderland theater in 1856. In spite of tricks of voice, gait and gesture, he was at the head of English actors of the time, and did much to elevate the drama. He visited the United States several times, and was always received with great enthusiasm. His chief rôles were well known to theatre-goers, especially his Charles I, Hamlet, Macbeth, Richard III and Matthias in *The Bells.* He was knighted in 1895. He died on Oct. 13, 1905.



SIR HENRY IRVING

Irving, Wash′ington, one of the best-known of American writers, was born at New York, April 3, 1783. He entered a law office at 16, his health preventing his taking a college course. His father's large library had supplied him with reading, Chaucer and Spenser being his favorite authors. In 1804 he traveled in Europe, meeting Allston, Kemble and Mrs. Siddons. He began writing in 1807, by essays contributed to a periodical called *Salmagundi.* His first large work was *A History of New York from the Beginning of the World to the End of the Dutch Dynasty*, and in it he made use of the quaint manners and customs still to be seen in the New York of his day. He engaged in business with his brother, the while continuing his literary labors, and, on the failure of the firm while he was in England, turned to his pen for a livelihood. The *Sketch Book* had appeared in New York, and Irving made an effort to sell the copyright to Murray and, afterwards, to Constable, the English publishers. Finally, on Sir Walter Scott's recommendation, Murray paid $1,000 for the book, afterward increasing it to $2,000. *Rip Van Winkle*, *The Legend of Sleepy Hollow* and *Westminster Abbey*, among the *Sketches*, made his reputation. His studies in Spanish history, at the invitation of Everett, then American minister to Spain, resulted in the writing of the *History of Columbus*, *Conquest of Granada*, the *Alhambra* and *Life of Mahomet*. To these were subsequently added the *Life of Goldsmith* and the *Life of Washington*, his largest work. In 1829 he was secretary to the American legation in England and in 1842 minister to Spain. His home on the Hudson, near Tarrytown, was in the region which his pen had made classic. Here he lived at "Sunnyside," with his nieces. He died on Nov. 28, 1859. See *Life* by P. M. Irving and *Memoir* by Charles Dudley Warner.

WASHINGTON IRVING

Isaac (*ī'zak*) ("he will laugh"), a Hebrew patriarch and pastoral chief, the son of Abraham and Sarah and half-brother of Ishmael. The incidents of his life, as recorded in *Genesis*, are well-known.

Isabella (*ĭz'ȧ-bĕl'ȧ*) **of Castile,** queen of Spain, was born on April 23, 1451, being the daughter of King John II of Castile. In 1469 she married Ferdinand V, surnamed the Catholic, king of Aragon. On the death of Henry IV, her brother, in 1474, she ascended the throne of Castile and Leon. Isabella was a woman of remarkable energy and talent, beautiful and possessed of winning grace, although at times proud and ambitious. She was always present in person at state meetings, and her name was placed with that of Ferdinand at the end of all official documents. She died on Nov. 26, 1504. History relates that Columbus, when he applied at the court of Spain for help in his projected voyage of discovery, failed to receive the sanction or aid of Ferdinand and the learned council. Columbus, discouraged, was about to leave for France, when he suceeded in interesting Isabella in his plan. The king remained indifferent, and pleaded want of funds. The queen in her earnestness exclaimed: "I pledge my jewels to raise the money." Columbus succeeded at last, and to Isabella belongs the honor.

Isabella II, Maria Isabel Luisa, ex-queen of Spain, was born at Madrid in 1830. She was the oldest daughter of Ferdinand VII and Maria Christina. In her third year, by the death of her father, she became queen, her mother being made queen-regent. An insurrection in favor of her uncle, Don Carlos, who sought the crown, at once broke out. For seven years war was carried on with great violence, but was at length checked by the aid of Britain, France and Portugal. On Nov. 10, 1843, she became queen in her own right, though nominally ruler from 1833, and shortly afterwards married her cousin. The chief events of Isabella's reign were efforts on the part of the United States to purchase Cuba; successful war with Morocco; quarrels with Chile and Peru. The nation became more and more impatient under the despotic rule of the last years of Isabella's reign; and, at length, in September, 1868, a revolution broke out, which ended in the formation of a republican government. Isabella fled to France. In 1870 she renounced her claim to the throne in favor of her son, Alfonso XII, who was proclaimed king in 1874. The latter died in 1885, and was succeeded by his son (born in 1886) as Alfonso XIII, the queen-mother (Marie Christina of Austria) acting as regent during the minority of her son.

Isaiah (*ī-zā'yȧ*) ("salvation of God"), the grandest of all Hebrew prophets, was the son of Amos. He spoke his oracles in the reigns of Kings Uzziah Jotham, Ahaz and Hezekiah of Judah, about 740 B. C. Very little is known of Isaiah's life. He seems to have resided at Jerusalem in the vicinity of the Temple was married, and had three sons, who were given, he says, "for signs and wonders in Israel." The period of his death is not known; but by Jewish legend he was sawn asunder by order of King Manasseh. If this be true, Isaiah was nearly 100 years old at the time of his martyrdom. His writings, found in the book that bears his name, are very rich in style and variety. Some people say that *Isaiah* 40-66 was not written by Isaiah. See *Prophets of Israel* by Robertson Smith and *Isaiah* by Driver.

Ischia (*ē̇s'kē̇ ä*) (the ancient Ænaria), an island on the northern side of the entrance to the Bay of Naples, six miles from the mainland. Its area is about 26 square miles, and its population 22,170. The island has long been a favorite summer resort. It is noted for the excellence of its mineral waters and numerous springs, the great richness of its soil, the exquisite flavor of its fruits and wines and the enchanting character of its scenery. Its highest elevation is the volcano, **Mount Epomeo,** 2,618 feet above the sea. It is subject to earthquakes. The island produces fruits, wines and olive oil, and the inhabitants carry on extensive fisheries. See *Earthquakes of Ischia* by Johnston-Lavis.

Ish'mael ("God will hear"), the son of Abraham and Hagar, the Egyptian handmaid of Sarah. His story is told in *Genesis*. Mohammed claimed descent from Ishmael.

Ish'peming, a city of Michigan, 15 miles west from Marquette and 367 miles north of Chicago. It is in the center of the Marquette Range of iron ore deposits. The ore is both hard and soft. The soft ore is known as the red hematite and the hard as black band. (Some of these mines run under the city and are famous for their high percentage of iron.) Gold deposits are also found (in close proximity to the city limits). Marble quarries are also being opened. A small part of the ore from this region is reduced to pig iron at Marquette and Gladstone, but most of it passes through the big furnaces at Buffalo and Pittsburg. About 3,000 men are underground every day. Nine nationalities are represented among the miners. The most numerous are Scandinavians, Cornishmen and Finlanders. The population (1910) is 12,835. The Cleveland Cliffs Company of this section received the first prize from the Louisiana Purchase Fair — gold medal for housing the working classes and general welfare. This award was made from the department of social economy, and all countries competed. Ishpeming is said to be the best mining city in the U. S. It is famous for its public schools and the high moral standing of its people.

Isinglass (*ī'zĭn-glȧss*) is the purest commercial form of gelatine. It was formerly obtained only from the common sturgeon, and consisted of the dried air bladder of the fish. The same part in other fishes is also used in its preparation. The commerce in this article was at one time confined to Russia, where the sturgeon is taken, but large quantities are now brought from South America and some from the East Indies, New York and Canada. An inferior kind is made of cod sounds and soleskins or even from skins, hoofs and horns. Isinglass is extensively used in cookery for the preparation of jellies, creams etc. It is also used in refining beer and other liquids and for making the finer kinds of glues and cements. Isinglass is the popular name for mica, a mineral found in large quantities, having a bright luster. It is remarkable for the readiness with which it splits into thin, elastic plates, which are generally transparent. The plates are sometimes not more than the 300,000th part of an inch in thickness, usually very clear. This substance is much used in the manufacture of stoves, its transparency making it valuable. Plates of mica of large size are also used in Siberia, Peru and Mexico as a substitute for glass in windows. Mica is often substituted for glass in lanterns, as it bears sudden changes of temperature better, and in ships of war, as it does not break so easily upon the discharge of cannon.

Isis (*ī-sĭs*), an Egyptian goddess, was the sister and wife of Osiris. Osiris was murdered by Seb, and the corpse placed in a coffin and thrown into the Nile Isis discovered it, and in her grief was herself discovered. Isis lamented so deeply that the youngest of Queen Astarte's sons died of fright. Having buried the coffin in a retired place, Seb discovered the body during her absence, and cut it into pieces which he scattered far and wide. These Isis collected and buried in a stately tomb at Philæ. When she died, her soul was believed to have passed into the star Sirius. Isis is one of the principal figures in Egyptian mythology, and her worship was universal through all Egypt, where her tears were supposed to cause the yearly overflow of of the Nile. In the monuments she is called the goddess-mother, the mistress of heaven, the eye of the sun and the queen of the gods.

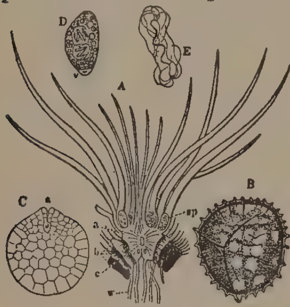
Is'lam. See MOHAMMEDANISM.

Isle of Pines (Spanish *Isla de Piños*), is a fertile island 38 miles from the Cuban coast, lying to the south It is under Cuban government. The island is of a nearly circular shape, its average diameter being over 30 miles. Cattle form the chief article of produce. Good marble is obtained from the quarries. Area: over 1,200 square miles; population: between 3,000 and 4,000.

Isles of Shoals, a cluster of nine barren, rocky islands in the Atlantic off New Hampshire. The largest two are Appledore, containing 400 acres, and Star, with 150 acres. On these are large hotels for visitors, who resort there for the sea air, bathing and fishing. A steamer runs daily to the islands from Portsmouth. On White Island is a revolving light, 87 feet above the sea. The inhabitants are fishermen. See Celia Thaxter's *Among the Isles of Shoals*.

Isocrates (*ī-sŏk'rȧ-tēz*), one of the ten Attic orators and one of the most remarkable men in the literary history of Greece, was born at Athens in 436 B. C., and died in 338 B. C. Isocrates took no active part in public life. During the Peloponnesian war he lost his fortune, and about 392 adopted the profession of a teacher. He deserves the credit of having been the first to discover this resource. His real vocation was discovered the moment he devoted himself to the work of a teacher and writer. The instruction was based on rhetorical composition, but was by no means merely rhetorical. The celebrity of the school is strikingly attested by ancient writers. It drew disciples from every Greek state. During his later years he wrote on public questions of the day. Seeing the dangers which threatened Greece, he wrote earnestly in behalf of unity and advocated an invasion of Asia by Greece. The vision of the Greek race "brought under one polity" was not fulfilled as Aristotle or Isocrates saw it. But the invasion of Asia by Alexander became the event which actually opened new and larger destinies to the Greek race.

Isoetes (*ī-sō′ē-tēz*), a small genus of aquatic plants known as quillworts, which belong to the pteridophytes. By some the genus is put with ferns and by others with club-mosses. It resembles a bunch of fine grass growing in shoal water or mud, but the leaves enlarge at the base and overlap one another on the very short tuberous stem. In each enlarged leaf base there is a single sporangium of interesting structure. Isoetes has attracted a great deal of attention because it is heterosporous, and has the general appearance of monocotyledons. There are some who believe that the monocotyledons have been derived from isoetes or from forms closely allied to it.



ISOETES

A quillwort (*A*), showing microspore (*D*), sperm (*E*), megaspore (*B*), and a female gametophyte (*C*) with an archegonium (*a*).

Isog′amy, a condition in plants in which the sexual cells (gametes) are alike, that is, they cannot be distinguished as male and female. Only the lowest plants are isogamous. The contrasting term is heterogamy, which see.

Isos′pory (in plants). See Homospory.

Isothermal (*ī′sō-thĕr′ mal*) **Line** or **Isotherm,** a term used in meteorology to denote the line obtained by joining all contiguous points having the same temperature. The United States Weather Bureau publishes each month a map of the United States on which are drawn lines connecting adjoining localities which have had the same mean temperature for the past month. These lines are called isotherms. In physics the word is used in a slightly enlarged sense to indicate any curve which represents the manner in which one quantity varies with another *while the temperature remains constant.* Thus the curve which shows how the volume of any given mass of gas changes, when the pressure is altered, is called an *isothermal line.* For full discussion see Maxwell's *Theory of Heat,* chap. VI.

Ispahan (*ĭs′pȧ-han′*), properly **Isfahan,** a famous city of Persia, capital of the province of Irak-Ajemi and formerly capital of the entire country. It is situated on the Zenderud, in an extensive and fertile plain. It still is an important city, the seat of manufactures of all sorts of woven and ornamental goods, firearms, swordblades, glass and earthenware. Under the caliphs of Bagdad Ispahân was a large trading town; in 1387 it was taken by the Tartar conqueror, Timur, and 70,000 of its citizens massacred; in the 17th century it became the capital of Persia, and was a city 24 miles in circumference, with 600,000 inhabitants. It was the great city of the east. After the ravaging of the city by the Afghans in 1722, Teheran became the capital. Ispahân is the religious center of Persia, the seat of the high priest. Population 80,000.

Israel in Egypt. One of the greatest of Händel's 19 English oratorios composed in the fall of 1738. The words are Biblical, including "The Song of Moses" in *Exodus* 15. The first performance was on April 4, 1739. The work as originally produced consisted of 39 numbers, 28 of which were massive double choruses — a veritable mountain chain of harmony. The experience of this early performance led to the addition of four recitatives and two airs, which in a measure relieved the continuous strain of listening to such a succession of choruses. It was not until 1831 that the work had its first performance by the *Sing-Akademie* of Berlin and still later (1849), when it was given as first composed, by the Sacred Harmonic Society in England. The reputation of Händel has suffered from the fact that in this oratorio, as elsewhere, he unwarrantably appropriated the work of other composers where it suited his purpose. This reflects less upon his superior genius as a composer than it does upon his rectitude as a man, since in each instance he has "touched (stolen) but to adorn."

Ital′ian Literature. See Literature.

Italio-Turkish War. (See Turkey.)

It′aly, a country of southern Europe, which consists of a long stretch of peninsular mainland, closely resembling a boot in outline and including several islands. From the southern boundary of Sicily to the Alps its greatest length is about 700 miles, its breadth being 350 miles. Its natural limits are strongly defined by the Alps and the sea. The area of Italy is 110,550 square miles with a population of 34,565,198.

Surface. Northern Italy is for the most part one great plain, the basin of the Po. In central Italy the great Apennine chain gives a picturesque grandeur to the country. In the highland districts of Naples the Apennines reach an elevation of nearly 10,000 feet. The beautiful scenery of the coast plains is noted, and the brilliant flowers and vegetation give a novel beauty to the landscape. The chief mountain systems are the frontier ridge of the Alps — the highest peak in Italy is 13,652 feet high — and the Apennines Italy has a number of volcanoes, of which the most remarkable summits are Vesuvius, which is still active, near Naples; Etna in Sicily; and Stromboli in the Lipari Isles. The great plains are those of Lombardy, Piedmont, the Venetian plains and Campo Felice.

Drainage and Climate. The Italian rivers, though numerous, are navigable only for the smallest vessels. The largest is the Po, 420 miles long, which rises on the borders of France and flows into the Adriatic. It has numerous tributaries. Among other rivers are the Adige, Arno, Tiber and Volturno. The mountain lakes are famous for their picturesque beauty. They are mostly in the northern provinces of Lombardy and Venetia. The largest are Maggiore, Lugano, Como, Iseo and Garda. The climate in the north is temperate, healthful and frequently severe in winter; in the central part it is more genial and sunny; and the heat of the southern provinces is almost tropical in its intensity.

Natural Resources. The mineral of greatest importance is sulphur, then come lead, zinc and iron. The following minerals also exist: mineral fuel, copper, antimony, manganese, mercury, salt, boric acid, graphite, asphalt, petroleum and coal. The scarcity of coal hinders the working of existing mines. Italy's quarries (which furnish much fine stone and the noted Carrara marble) give employment to nearly 60,000 men. Her fisheries employ nearly 100,000 men, who catch anchovies, sardines, tunnies etc., besides engaging in coral and sponge fishing.

People. The character of the people is in the main sober, industrious and thrifty, but with little real mechanical skill or ingenuity. Multitudes emigrate each year in search of work and homes; but all retain their passiontae love for the fatherland, and look forward to the time when they can return with a competency. They are quick to resent an injury, but have the warm natures and sympathetic feelings of southern people. There were 1,342,800 Italians in the United States in 1910.

Occupation. Agriculture employs nearly a third of the entire population, and manufactures only about half as many. The main products are corn, wine, oil, raw silk, rice, olives and tropical fruits, besides hemp, flax and cotton, which are largely grown. Silk manufacturing is of most importance, and the making of gold and silver wares is carried on extensively in the larger cities, as is also work in bronze; while the terra-cotta statues, busts etc. are of the greatest beauty. Italian cameos, mosaics and Venetian glass are known the world over. Wines, soaps and sugar are also manufactured to some extent.

Religion and Education. Roman Catholicism is the state religion, but religious freedom is granted to all churches. The pope by the law of 1871 has his own court in the Vatican. Italy is behind most of the European nations in the education of her people; but since the union of the states much progress has been made. There are 21 universities, the oldest being at Bologna and the largest at Naples. The state regulates public instruction, and maintains public schools of every grade, either entirely or in union with the provinces. The government is a constitutional monarchy, with a parliament consisting of a senate and chamber of deputies. The number of deputies is 508, chosen by the people, all who can read and write and pay a small tax having a vote. The senate (358 in number exclusive of five members of the royal family) is chosen by the king, and its members serve for life. Military service is required of all citizens from 20 to 39, and the whole number available for war is about 2,750,000 men. Italy has one of the strongest navies in Europe, and two of the armorclads were the largest warships ever built. The capital is Rome (population 575,000); the other chief cities are Naples (population 596,000), Milan (population 584,000), Turin (371,000) and Palermo (319,000).

History. The early history of Italy is that of Rome (which see). For 64 years after the invasion of the Goths they ruled in Italy, Teias, the last of the Gothic kings, being slain in battle about 553. The country then was divided, belonging now to the eastern and now to the western empire, with independent duchies and free cities. Eight kings of the Carlovingian line ruled in northern Italy until 887, followed by Italian sovereigns or dukes until, in 961, Otto was crowned king of Italy and emperor of Rome. For two centuries the right to the crown of the Roman empire belonged to the German kingship. There was no Italian kingdom except in name, and with her foreign emperors living beyond the Alps, the country was left without a head. The struggles for supremacy between counts, between popes and emperors and between cities, in the quarrels of the Guelphs and Ghibellines, continued for centuries. In 1177, at Venice, after the defeat of Legnano, Frederick Barbarossa the emperor agreed to a six years' truce, and in 1183 he made a treaty of peace with the Lombard towns. With the capture of Constantinople (1204) Venice gained large territories as reward for her services and became supreme in the Levant. In 1278 the popes were recognized as temporal sovereigns, and their power over Rome established. In 1309 the seat of the papacy was removed to Avignon, where it remained for 70 years. In the 14th and 15th centuries Italy was divided among five powers — the kingdom of Naples, the duchy of Milan, the republics of Florence and Venice and the papacy; the Medici family flourished; the papacy was restored to Rome; and Florence as a republic acknowledged the influence of Savonarola. The 16th century was the most disastrous in Italian history. The rivalry of Charles V and Francis I filled the land with foreign armies, the papacy being the gainer from the struggles. Francis I was driven out of Italy; Rome was sacked in 1527, the sack lasting seven months; the Medici were driven out, and restored and made grand-dukes of Tuscany. In 1529 the peace of Cambrai left Charles V master of Italy, and the peace of Château Cambray (1559) made his son Philip its undisputed lord. The papacy was strengthened by the founding of the order of Jesuits, the Inquisition and additions to its territory; and Venice made her last great achievment in a war that had lasted five centuries by the conquest of the Peloponnesus in 1684. After each of three European wars of the 18th century Italy was divided afresh. Napoleon entered Italy in 1796, reconquered it at Marengo in 1800, and was crowned king of Italy in 1805. The congress of Vienna in 1815 restored Italy to its former state. The year of revolution, 1848, opened with the party of Mazzini supreme. Pope Pius IX became a fugitive, and Garibaldi was in the field. Rome and Venice yielded to French armies, the pope and other petty sovereigns of Italy returned, and the revolution proved a failure. But Victor Emmanuel, Cavour and Garibaldi were ready for the coming struggle. Cavour made terms with Louis Napoleon, and the French and Italian troops won the battles of Magenta and Solferino, driving Austria to the east. In February, 1861, the first Italian parliament met at Turin, and Victor Emmanuel was proclaimed king of Italy. Venice was restored in 1866, and on Sept. 20, 1870, the king entered Rome and the emancipation of Italy was complete. The pope retained the Vatican, the church of Santa Maria Maggiore, the Lateran palace and the villa of Castel Gandolfo, and was given an income of $750,000 out of the revenues of the state. Italy, free and united, has become one of the great European powers. In 1878 Victor Emmanuel died, and his son Humbert I succeeded him and in the same year occurred the death of Pius IX, who was followed by Leo XIII. In July, 1900, Humbert was unhappily assassinated and was succeeded by the Prince of Naples, his son, who rules as Victor Emmanuel III. In 1911 Italy declared war upon Turkey and seized Tripoli, the war continuing through 1912. San Marino, an independent republic, is embraced in the area of Italy, besides the African dependencies on the Red Sea. Italy has 10,070 miles of railway and nearly 30,000 of telegraph lines. In 1905 it had close upon 6,000 postoffice savings banks, with 5,527,332 depositors, and over a thousand million *lire* of deposits. (The *lira*, plural *lire*, is worth 19 or 20 cents). See *Renaissance in Italy* by Symonds; *Garibaldi and Italian Unity* by Chambers; *Life of Cavour* by Mazade; *Italy* by W. Hunt in Freeman's Historical Course; *Life of Victor Emmanuel* by Godkin; Hodgkin's *Italy and her Invaders; Hare's Cities of Italy;* Murray's *Handbook* for *Italy*, for *Rome* and for *Venice;* Deecke's *Italy;* and Marion Crawford's *Southern Italy, Sicily* and *Ave Roma Immortalis.*

Ith′aca, county-seat of Tompkins County, southwest central New York, is situated on Cayuga Lake, near the southern end and on the slopes of the neighboring hills, 35 miles northeast of Elmira by rail. Ithaca may be reached by the New York Central, east and west, connecting with the lake steamers at Cayuga, and by the Delaware, Lackawanna and Western, Elmira, Cortland and Northern and Lehigh Valley railways. It has a large trade in coal and a number of foundries, mills and factories. It has fine churches and schools and a public library. Ithaca is the seat of Cornell University which, founded in 1868, has become one of the largest in the country, with 516 teachers and 4,200 students. It has received a grant from congress of 990-000 acres of land and very large amounts from private individuals. There are 600 free scholarships for the youth of the state. Population 14,802.

I′to Hi′robu′mi, Marquis, a Japanese statesman and prime minister; born in the province of Chosu in 1840. A secret journey to Europe convinced him of the superiority of western civilization and since that time he has been one of the leaders in westernizing his native land. In 1871 he visited the United States to investigate the coinage system, and upon his return to Japan he assisted in establishing the mint at Osaka. On a second trip to Europe in 1880 he was favorably impressed with the German methods of government, and his attempts to introduce them into his own country have given him the name of the Japanese Bismarck. In 1886 he assumed the leading place in the Japanese cabinet, and,

MARQUIS ITO

under the title of minister president of state, instituted sweeping economical reforms, and during the next two years everything was done to make Japan the Asiatic counterpart of the German empire. A reaction in 1888 resulted in Ito's retirement from the premiership, to which, however, he was recalled in 1892. In the war with China in 1894–95 he played a leading part, being premier of the empire and high admiral of the Japanese fleet. In recognition of his services he was made a marquis. He was prominent in the conduct of the Russo-Japanese war and later was resident-general of Korea. He was assassinated by a Korean at Harbin, Manchuria, Oct. 26, 1909

Iturbide (*ē'tōōr-bē'thā*), **Don Augustin,** emperor of Mexico, was the son of a Biscayan nobleman and a rich Creole. He was born at Valladolid, Mexico, in 1783. In May, 1822, he ascended the throne of Mexico as emperor, under the name of Augustin I, and the congress declared the crown hereditary in his family. He was rather a despotic sovereign. His reign was full of trouble, and came to an end in less than a year by his abdication of the throne, March 20, 1823. He was banished to Italy with a pension. He attempted in 1824 to regain his crown, and was shot.

I'tys, in Greek mythology, son of Procne and Tereus. After the birth of Itys, Tereus concealed Procne in the country, that he might marry her sister Philomela, whom he deceived by saying Procne was dead. At the same time he deprived Philomela of her tongue. She, however, soon found out the truth and made it known to her sister by a few words which she wove into a peplus. Procne thereupon killed her own son, Itys, and served up the child's flesh in a dish before Tereus. She then fled with her sister. When Tereus was about to overtake the fleeing sisters, the gods, in answer to their prayer, changed all three into birds: Tereus into a hoopoe or hawk, Philomela into a swallow and Procne into a nightingale, which from that time to this has never ceased to cry: "Itys, Itys."

I'vaine, also spelt Yvain and Ywaine. Sir Ivaine was a knight of King Arthur's Round Table. See *Idylls of the King*.

Ivan (*ē-vän'*), the Russian form of John, is the name of a number of Russian czars.

Ivan (or Joaan, *i.e.*, John) I, grand-duke of Moscow from 1328 to 1340, was surnamed Kalita, in allusion to the purse which he always carried at his girdle. The importance of Ivan in Russian history is that he was the consolidator of the power of Moscow, the nucleus out of which the empire was to be formed at a future period.

Ivan III, surnamed the Great, grand-duke from 1462 to 1505, forms one of the most important figures in the annals of Russia, for to him is due the consolidation of the autocracy (*i.e.*, absolute and independent power). His long reign of 43 years was very beneficial to his country. He was a skillful diplomatist, and often brought about by intrigue what others could effect only by force of arms. In 1472 he married Sophia, niece of Constantine Palæologus. On account of this union Ivan considered himself the heir of the Byzantine emperors, and adopted the two-headed eagle for his arms. Embassies were sent to foreign powers. Italian architects were invited into Russia. Many learned monks found refuge there from the yoke of the Turk.

Ivan IV, called the Terrible, is the best known. He reigned as czar from 1533 to 1584. While his reign was marked by many improvements in the arts and sciences and in the advancement of the wealth and prosperity of his kingdom, his name was a terror to most of his subjects. The first printing-press in Russia he established. He was cruel and heartless, and in some of his towns large numbers were killed. In Novgorod, during the latter part of his reign, 60,000 people were slain in six weeks. Ivan died of sorrow for his son, whom three years before he had slain in a mad fit of anger. He was the first Russian sovereign to be crowned as czar, and from his reign dates the annexation of Siberia. A plot was discovered to deliver parts of his territory into the hands of the king of Poland, and it was to revenge this treason that he executed large numbers both of the innocent and guilty. See *Ivan the Terrible* by Pember.

I'vanhoe, one of the best of the novels of Sir Walter Scott, was published by him in 1819. The book takes the hero's name. Ivanhoe is the son of a Saxon freeholder who has not lost his mistrust of the Normans nor his own independence. Ivanhoe himself, however, is well-versed in Norman arms and manners; and in the Holy Land has been the bravest of the warriors of the lion-hearted Richard I of England. His return in the guise of a pilgrim, his victory in the admirably described tournament, his adventures, together with those of his royal master, and a motley but representative assemblage of characters (including the sluggish but powerful Saxon Athelstan, the greedy Norman Baron Front-de-Boeuf, the Templar Brian-de-Bois-Guilbert, the old Jew Isaac and his brave and lovely danghter Rebecca, the outlaw Robin Hood, the hedge-priest Friar Tuck, the swine-herd Gurth and the jester Wamba) make *Ivanhoe* one of the most delightful tales of the early middle ages written by any modern novelist.

I'vory, the name given to the tooth-substance of all animals, but now only used of the teeth and tusks of the elephant, which are of the character of true ivory. Many other animals, however, possess teeth, horns or tusks, which, from their large size and density, can be used for the same pur poses as true ivory. Some of these are the walrus, narwhal, hippopotamus and rhinoceros. The ivory of the tusks of the African elephant is held in the highest estimation by the manufacturer, on account of its pure whiteness and its density. The tusks are of all sizes, from a few ounces in weight to more than 180 pounds each. Some have been known to weigh as much as 200 pounds. Elephant tusks have from very early periods been an important article of trade, because of their great beauty as material for ornaments and in works of fine art. A small part of the ivory of commerce comes from Ceylon, India, Burma and the islands of the Indian archipelago. The greater part is obtained from the African elephants, and the traffic in ivory was the main support of the slave trade in that country. Fossil ivory is found in small quantities in Siberia, being the tusks of the extinct mammoth. The price of pure ivory is from about $250 to $300 per hundredweight. The quantity imported each year into Europe is about 12,500 hundredweight, which must require the sacrifice of nearly 40,000 elephants. The elephants are killed in the interior of Africa, and the ivory conveyed to the coast (formerly) on the backs of slaves. Ivory is in chief demand for knife and other handles, combs, piano keys, billiard balls and chessmen, and is carved into figures and ornaments. The use of ivory can be traced almost to the earliest period when man existed. We read that King Solomon "made a great throne of ivory." There still exist examples of Egyptian ivory, inlaid, as ancient as the days of Moses. In the British Museum are many Assyrian ivory carvings, made in Nineveh nearly 1,000 years before Christ. In ancient Greece ivory was used for carvings, sculpture and various objects of luxury. Many of the most famous works of Pheidias and his fellow artists were statues built of plates of ivory and gold, some figures being 40 feet in height.

I'vory Coast, French. A dependency of France in Africa, acquired in 1843, but not actively and continuously occupied till 1883. It lies between Liberia and the Gold Coast colony of Great Britain in French West Africa. Area 12,000 square miles, with a population estimated at two millions. It extends inland from the coast to the military territory in French Sudan. The chief exports are palm oil, india-rubber and gold. Coffee and rice are also cultivated. The capital and chief port is Grand Bassam, while the seat of administration is now Bingerville. This place was formerly called Adjame, and is being improved by extensive building operations, and gold mining is assuming importance. The harbor works at Port Bouet, formerly Petit Bassam, are begun, and the railway from Abijean on the other side of the lagoon will have its first stretch of 110 miles to Eryman Konguié finished in 1908. Telegraph lines run between the principal towns, and the telephone is in operation from Bassam to Bingerville and elsewhere. The colony is self-supporting, income and outgo in 1911 being about 5,474,000 francs.

Ivory, Vegetable. This curious material is furnished by a palm-like plant, which grows on the Andean plains of Peru, on the banks of the Magdalena and in other parts of South America. It forms the type of a natural order of plants, intermediate between the palms and the screw pines. The plant throws up a magnificent tuft of light-green, pinnated leaves of extraordinary size and beauty, like immense ostrich-feathers rising from 30 to 40 feet in height. The fruit, which is as large as a man's head, consists of many, four-celled, leathery drupes massed together. and contains numerous nuts of a somewhat triangular form, each nut being nearly as large as a hen's egg; they are called corozonuts in commerce. The kernels of these nuts when ripe are exceedingly hard and white; in fact, they resemble ivory so completely that few names have ever been better applied than that of vegetable ivory. They are in extensive use by turners in the manufacture of such articles as buttons, umbrella handles and small trinkets.

IVY, SHOWING THE AERIAL ROOTLETS

I'vy, a name applied to a variety of woody plants which have the habit of climbing by means of sucker-like discs, so that they can attach themselves to walls and other vertical surfaces. This habit makes the plants valuable in connection with the covering and ornamenting of walls, houses, churches etc. The common European ivy is *Hedera helix*, which belongs to the aralia family. It is evergreen, with entire or three-to-five lobed leaves and usually black berries. It is an exceedingly variable species, and more than 60 species have been cultivated in European gardens The American ivy or woodbine is a species of *Ampelopsis*, a genus which belongs to the grape family. It is a much more rapid-growing vine than the English ivy, and its leaves color bright scarlet in autumn. About 20 species are known in North America and

Asia, the common one in the United States being *A. quinquefolia*, often called the Virginia creeper. Japan ivy or Boston ivy is also a species of *Ampelopsis* (*A. tricuspidata*), being especially useful, since it covers walls very densely and its glossy leaves stand dust and smoke well. This probably is the favorite among the hardy vines in cities. The name of poison ivy is applied to various poisonous species of *Rhus* (*R. toxicodendron*, also known as poison oak, being the chief one), a genus which belongs to the cashew family

Ixcaquixtla (*ēs-ka-kēs'-tla*), an old town in Puebla, Mexico, with a population of 5,000. It is noted for a severe battle on Jan. 1, 1817, between the Spanish troops under La Madrid and Mexican rebels under General Mier. It is occupied by the Chuchan Indians and the remnants of a race of southern Mexico, who were conquered by the Aztecs and Mixtecas. Near the town are numerous mounds of earth or stone, now used by the Indians as altars for their offerings to Moctezuma.

Ixion (*iks-ī'-on*), according to Greek story, a Thessalian prince, king of the Lapithæ. When the father of his bride demanded the usual bridal gifts, Ixion invited him to a banquet and treacherously had him thrown into a fiery pit. No one would have anything to do with the murderer or purify him from his guilt; so Zeus took him up into heaven to be purified. But when Ixion dared to make love to the goddess Hera, he was bound hand and foot to a fiery wheel, which rolled forever in the sky.

Ixtapalapa (*ēs'-tă-pă-lă'pā*), a town of Mexico, ten miles southeast of the capital, It has a population of about 3,000. When Mexico was conquered, it was a large and important city, noted for the beautiful gardens of the Aztec kings, and was the residence of a brother of the ill fated Aztec emperor, Moctezuma.

Ixtlilxochitl (*ēsht'lĭl-shō̆'chē̆t'l*), **Fernando de Alba,** a Mexican historian; born in Texcuco about 1568; a lineal descendant of the ancient emperors of Texcuco, who devoted himself to the collection and translation of hieroglyphic records concerning his ancestors. Comparatively little was known of his writings until their importance was announced by Clavigero and Humboldt. His history was divided into thirteen books, and covered the period from the earliest times to the destruction of the Mexican empire. Prescott, who made use of these works in his *History of Mexico*, calls the author the Livy of Anahuac. He died at Texcuco in 1648.

Izalco (*ēs-äl'-kō*), **Mount,** a remarkable volcano, 36 miles northwest of the city of San Salvador. It is near a group of extinct volcanoes, 6,000 feet high. Its first eruption occurred in 1770 during an earthquake. The eruptions are almost incessant and of unusual violence, and are visible far out at sea. Sailors call it the lighthouse of San Salvador. Izalco, with the exception of Jorullo in Mexico, is the only known volcano that has arisen from the level of the plain in the memory of man. In 1798, after a series of earthquakes, dust and pebbles were seen rising from an opening in the plain. Soon after, lava was thrown up, and this, together with huge stones, slowly piled up around the opening till the vast cone, as it now stands, was formed.

Iz'ard, Ralph, an American statesman, was born near Charleston, S. C., in 1742, and educated at Cambridge, England. He was a man of large wealth, and pledged his estate to aid in carrying on the war for independence against England. In 1776 congress appointed him a commissioner at the court of the grand duke of Tuscany, and in 1780 he returned to the United States. It is said that no one had the confidence of Washington to a higher degree than Izard and that he was largely instrumental in securing the appointment of General Greene to the southern army. In 1782–83 he was a delegate to the Continental congress, and from 1789 to 1795 was a United States senator from South Carolina. His *Correspondence from* 1774 *to* 1784 was published in 1844. He died at South Bay, near Charleston, May 30, 1804.

Iztaccihuatl (*ēs-tȧk-sē'hwȧt'l*), a Mexican volcano, 16,705 feet in height, is situated not far from the volcano of Popocatepetl, near the city of Puebla. Its summit is almost always covered with snow, and its name means white woman from its fancied resemblance to a woman in a white dress. There are no eruptions now from Iztaccihuatl.

J

J (*jay*), the tenth letter, is a compound vocal consonant nearly equal to *dzh*, as in *jar*. It is a variation, originating about 1600, of *I* used as *y* in *yet*. It is classified as a diphthongal palatal, because compounded of *d* and *zh* and made by the point of the tongue on the back of the hard palate.

Jack′al, a dog-like animal, smaller than the wolf, inhabiting southern Europe, Asia and northern Africa. It has a pointed muzzle, like a fox, and a bushy tail about one third the length of the body. The common jackal of southern Asia is the best known. It is grayish yellow in color, darker above and lighter below. During the day jackals remain concealed in burrows, caves and sheltered places, but at night they hunt, frequently in packs. They utter a piercing unearthly cry, and the howling of a pack at night is familiar in oriental villages. They feed on smaller mammals, poultry and especially carrion, quarrelling over the latter with the vultures. They shadow wounded animals and haunt battlefields and burying-grounds. When running in packs, they often attack sheep and antelopes. They are easily tamed, and probably represent one of the breeds from which the domestic dog is descended. They are harmless if left unmolested, but when cornered fight desperately.

JACKAL

Jack′daw, a common Old World bird of the crow family, found in Europe, Asia and North Africa. It is smaller than its closest relations, the crow, raven and rook, being about 14 inches in length. Its color is black, with gray at the sides of the neck, and it has a straighter bill than other crows. It builds nests in holes, cavities in rocks, church-towers, chimneys and uninhabited buildings. It feeds chiefly on insects. The jackdaw is easily tamed, and, besides making an interesting pet, can be taught to imitate the human voice.

Jack′son, Andrew. One of the most original and forceful characters that ever appeared in American public life is this seventh president of the United States. He died in 1845; the issues of his day have long since become ancient history; but Jackson's is still a name for the Democratic party to conjure with. He expressed a definite, vital idea stamped with a picturesque personality. He was worshipped and vilified but could never be ignored. Tradition still votes for him, for his party's candidates for office must measure up to certain standards laid down by Jefferson and Jackson.

ANDREW JACKSON

Jackson was the product of a peculiar period of transition in American life and ideals. Born in the Waxhaw Settlement, South Carolina, in 1767, two years before Daniel Boone penetrated Kentucky, he was a generation later than Boone, a generation earlier than Lincoln. As a boy of 13 he saw service in the last years of the Revolution. As a youth of 20 who had, although early orphaned and in spite of poverty and impatience of restraint, made of himself a lawyer, he was in Tennessee as prosecuting attorney. He prosecuted lawbreakers, carved a plantation out of the wilderness, fought Indians and had duels, raced horses, organized the machinery of civic life and loved his wife — all with equal facility and ardor. In 1813 he organized a volunteer force of 3,000 men and marched against the Creek Indians. Until the battle of Horseshoe Bend, March 27, 1814, which broke the power of the red man in the south, Jackson had had only local fame. Four days later, with the sobriquet of Old Hickory, won by his endurance of hardships in the campaign, he was appointed a major-general in the regular army, with orders to defeat the British forces in the south. Although Pensacola, Florida, was in Spanish territory, the British were using it as a base of operations. Jackson stormed and captured the seaport. He then, with 4,000 troops and 12 guns behind breastworks, defended New Orleans against 12,000 British veterans. The victory was so great that its anniversary, January 8, is still celebrated as Jackson Day. He added to his military fame by defeating the Seminole Indians of Florida in 1819. On the purchase of that territory from Spain he became its first governor.

The typical hero on horseback, he rode with a dash into the arena of national politics as United States senator from Tennessee. The next year he was an unsuccessful candidate for president. Thomas Jefferson, the founder of the Democratic party, then within two years of his death, recognized the fiery westerner as the future leader. Jackson's election to the presidency in 1828 was of immense significance. It marked the apotheosis of the new west — vigorous straightforward, forceful, crude. His bold application of the spoils system alarmed the country as well it might, for it was productive of corruption in the public service for the next half century. But this is not all he stood for. He revived the tradition of Jeffersonian simplicity, but he repudiated the doctrine of state sovereignty. His personal force must have been great, indeed, for him to ride thus over a principle of his party that had become an article in the political creed of the south, his own section. South Carolina during his administration refused to obey a tariff law passed by Congress, but it submitted when Jackson issued a proclamation to the effect that all Federal laws would be enforced and could not be nullified by the states. Yet when, at a banquet, he proposed the toast: "The Federal Union; it must be preserved," his vice-president, John C. Calhoun, proposed another: "Liberty dearer than Union." The eight years of his administration were marked by relentless war on the United States Bank. Tyrannical to the last degree, Jackson broke up his cabinet to force the social recognition of a good woman of lowly birth.

His power survived all these shocks, and he retired from the presidency with increased popularity to become his party's dictator. He secured the succession to his favorite, Van Buren, and crushed the political aspirations of Calhoun. He had made of the Democratic party an organization that was to rule the country up to the Civil War.

A loyal friend, he believed Aaron Burr to be maligned and defended him successfully against the charge of treason; a bitter foe, he shot the man who slandered Mrs. Jackson, and he carried a loaded pistol for 30 years to defend her good name. On his plantation he was Sir Harry Hotspur turned patriarch. His great colonial mansion, The Hermitage, was always filled with guests. He adopted his wife's son by a former marriage, and cared for her numerous young relatives. He wore crape for his wife for 17 years. He died at The Hermitage, near Nashville, June 8, 1845, and was buried in the garden. The estate is owned by Tennessee, and the mansion is preserved as a museum of Jackson relics. See *Life* by James Parton and by Major Eaton.

Jack'son, a city and the county-seat of Jackson County, central southern Michigan, lies on both sides of Grand River, which is here crossed by 17 bridges (five of iron) 76 miles west of Detroit and 37 south of Lansing, at the intersection of several railroads. It has a number of flour, paper and planing mills and foundries and machine shops; the Michigan Central locomotive-works, breweries and manufactures of automobiles, furniture, carriages, wagons, boilers and machinery, farming implements, corsets, underwear etc. There is a flourishing general trade. Within the city-limits and close by are several mines of bituminous coal. The city has handsome churches and public school buildings, Y. M. C. A building, a masonic temple and a Carnegie Library. Jackson was settled in 1830 and became a city in 1857. Population 31,433

Jackson, capital of Mississippi and county-seat of Hinds County, stands on a plain on the right bank of Pearl River, which becomes navigable here. The city lies 45 miles east of Vicksburg and 180 miles north of New Orleans by rail. It is situated in a rich cotton-growing region, and, as the railway and geographical center of the state, it has an important and growing trade. Being the capital, it is the seat of several important state institutions and asylums, Millsap's College (M. E.) and the Bell Haven College for young women. The city is noted for its beautiful residence streets, with houses standing in the midst of gardens. The great industry of the surrounding region is cotton-growing, and in average years, from 30,000 to 40,000 bales are shipped from Jackson. Among its industrial establishments are cottonseed-oil mills, a cotton-compress, foundries and fertilizers, sash, door and blind factories. Population 21,262.

Jackson, county-seat of Madison County, Tennessee, on the south fork of Forked Deer River, 107 miles by rail southeast of Cairo, Ill. It is the seat of Southwestern Baptist University, of Memphis Conference Institute (M. E.), St. Mary's Academy (R. C.) and Lane College for colored students. It has excellent public schools, a high school, a public library etc. Jackson is of importance as a cotton-market; and has planing and other mills and railway shops. Its factories produce engines, boilers, iron and steel bridge material and church and school furniture. Population 15,779.

Jackson, Helen Hunt (maiden name Helen Maria Fiske), was born at Amherst, Mass, Oct. 18, 1831. She studied at Ipswich Female Seminary, and in 1852 married Major E. B. Hunt (d. 1863) of the United States engineers. She afterward married

William S. Jackson, and lived most of the latter part of her life at Colorado Springs, Colorado. She began to write verses about 1870 over the signature "H. H.," which soon became familiar to magazine readers. She had always been interested in the welfare of the Indians, and her book, *A Century of Dishonor*, made her their champion. In 1883 Mrs. Jackson was made a commissioner by the government to look into the condition of the mission Indians of California. Her last book, *Ramona*, which deals with Indian life, leaped at once into great popularity. She died at San Francisco on Aug. 12, 1885.

STONEWALL JACKSON

Jackson Thomas Jonathan, known as "Stonewall" Jackson, was born at Clarksburg, (W.) Va., Jan. 21, 1824. The father died when Thomas was but three years old, and the mother was left with three children and no means of support. To provide for herself she taught school and worked at sewing. The children were given to their uncles and aunts. Thomas went to live with Cummins Jackson, an uncle, who took a father's place, and in 1842 secured his appointment in the national military academy at West Point. His appearance when he entered has been described as follows: "A slender lad, who walked rapidly, with his head bent forward; a grave, thoughtful face, which gave him a dull look; but when anything interested him or excited him, his form became erect, his eyes flashed like steel, and his smile — sweet as a girl's — would brighten his whole face." After graduation he was sent to aid General Scott in the Mexican War. He acquitted himself so well that he returned with the rank of major. When the Civil War broke out, Jackson was settled at Lexington, Va. He sided with his state, and joined the Confederate army under Robert E. Lee. On July 3, 1861, he was made brigadier-general. In the battle of Bull Run, Jackson was supporting General Bee, with his forces ranged on a hill near by. Bee, to encourage his soldiers, pointed to the ridge and cried out: "There is Jackson standing like a stone-wall: rally behind the Virginians." A moment later Bee was killed. Soon after, Jackson's force was engaged with the enemy. His order to the men was: "Reserve your fire till they come within fifty yards; then fire and give them the bayonet; and when you charge, yell like the furies." This is said to have been the origin of the afterward well-known "rebel yell." He was made major-general in the spring of 1862, and in the campaign of the Shenandoah he outgeneraled McDowell. Banks and Fremont and drove them back upon the lower Shenandoah. Then, hastening by forced marches to Richmond, he turned the tide at Gaines' Mill in June and won the battle of Cedar Run in August. His troops bore the brunt of the fighting in the second battle of Manassas. In September he captured Harper's Ferry, with 13,000 prisoners and 70 cannon, and after a trying night's march joined Lee next day and probably saved him from disaster at Antietam. As lieutenant-general he commanded the right wing at Fredericksburg, and drove Hooker back at Chancellorsville, May 1, 1863. All next day Jackson was on the march, moving around the flank of the Federal army; at nightfall he fell upon its right and drove it back. Returning from a reconnoissance, his party was fired on by some of his own command, who mistook him for a Federal general, and Jackson received three wounds, from which he died on May 10, 1863. Jackson was the idol of his soldiers, who not only admired his bravery but believed in his generalship. "His loss," writes Greeley, "was the greatest yet sustained by either party in the fall of a single man." Jackson was a muscular man, fully six feet high, with a clear, pale complexion, bluish-gray eyes, an aquiline nose, prominent chin, strong jaws, large head and high forehead. He was a man of deep moral earnestness and of great natural bravery, vigor and promptness of action. See his *Life* by Randolph and his *Journal*, edited by Mrs. Jackson.

Jack'sonville, a notable winter health-resort in northeastern Florida, the county seat of Duval County and the principal business town in the state, is on the St. John's River, 23 miles from its mouth. Five railroads meet there. In a direct line it lies within 15 miles west of the Atlantic, where are the coast-resorts of Mayport and Pablo Beach. Thirty miles northeast is Fernandina, and forty miles southeast is St. Augustine. The streets of Jacksonville are wide and well-shaded; there are numerous hotels, chiefly for the accommodation of invalids and winter visitors. The city has a large coast-trade, besides an active river trade. The chief exports are lumber, cotton, moss, oranges, marmalade and early vegetables. Population 57,699.

Jacksonville, Ill., county-seat of Morgan County, stands in a fertile prairie region, at the junction of several railroads, 34 miles southwest of Springfield. It is noted for its schools. Here are Illinois College, Illinois Women's College, several conservatories of music and other educational institutions; and here, too, are state asylums for the blind, the deaf and dumb, the insane and, also, the idiotic and feeble-minded. The public-school system is excellent, and the city is greatly beautified by trees. There are manufactories of woolens, paper, machinery, boilers, lumber, confectionery, furniture etc. Population 15,326.

Ja'cob (Heb. *Supplanter*), one of the three chief patriarchs. His history and character are described in *Genesis*. His capacity for spiritual growth and true manhood is suggested by his name being changed to Israel or Prince-with-God. His sons were the ancestors of the twelve Hebrew tribes.

Jacobins (*jăk'-ō-bĭnz*), a political club which had great influence during the French Revolution. The club was at first called the Club Breton, and was formed at Versailles in 1789. The members were all in sympathy with the Revolution. The club met at the former Jacobin convent in Paris. Its power became greater than the national assembly, and no less than 1,200 branch clubs were formed. Almost all the great events which followed were determined by the voice and power of this club. It reached the height of its power in 1792. The popular cry for the death of the king, the uprising of the lower classes against the middle classes and the Reign of Terror throughout France were the work of the Jacobins. But upon the arrest, trial and execution of Robespierre in 1794 the Jacobin club began, to lose its influence. On Nov. 9, 1794 the club was suppressed. The term Jacobins is often employed to indicate persons of extreme revolutionary sentiments.

Jacquard (*zhä'kär'*), **Joseph Marie,** was an ingenious Frenchman, a native of Lyons, born on July 7, 1752. Early in life he was called upon to carry on the weaving business of his father, and set himself to work to improve the machinery then used in weaving. By his invention he made it possible for an ordinary workman to produce the most beautiful patterns with little labor. The reception of this great invention, like all others, was not encouraging. Napoleon rewarded the weaver by a small pension, but the great body of weavers so opposed the new machine, that on one occasion they tried to take the inventor's life and broke his machine in pieces. But the invention was too valuable to be kept long in the background, and in a few years weaving was almost revolutionized by its use, especially in the finer silk fabrics. On the spot where his machine was publicly destroyed now stands a fine statue of Jacquard. He died near Lyons on Aug. 7, 1834.

Jade, a hard, green stone, highly prized in oriental countries for making ornaments. It also is known as nephrite, being so named by the Greeks because often worn in diseases of the kidneys as an imagined remedy. It is a compact, translucent stone, usually but not invariably green or greenish in color, variable in composition. It is a variety of hornblende, and is often called axestone because of its frequent use among savages for making weapons and implements.

Jaf'fa or **Jop'pa,** a town situated on the seacoast of Syria, about 33 miles northwest of Jerusalem. Jaffa is a place of great beauty as well as of great age. Here, according to fable, Andromeda was chained to a rock and left to be devoured by a sea-monster. It was the port of Jerusalem in the time of David and Solomon. From here Jonah sailed for Tarshish. It was at Jaffa that Peter saw the vision that taught him that Christ came to save Jew and Gentile alike. It reached its greatest importance during the crusades, when it became the principal landing-place of the warriors of Christendom. In 1799 it was bombarded by Bonaparte, and upon the surrender of the town a cruel massacre of Turkish prisoners took place. The exports are soap, leather, oranges, wheat and sesame. The open harbor, the old walls, the yellow sandbanks and the large orange gardens are the chief features. There is a railway from Jaffa to Jerusalem, a distance of 54 miles. Population 45,000.

Jag'uar, the largest of American animals belonging to the cat family. An average specimen measures (with the tail) from six to seven feet. It is the tiger of the New World and the third most powerful of the entire cat tribe. The head is noticeably large, the legs massive. There is much variation in its color, but in general it is yellowish brown with spots like the leopard. The spots, however, are larger and more angular. It inhabits all South America, except Patagonia, and extends into North America as far as the Red River of Louisiana and the Medina River of Texas. It is found in the forests, especially along the Amazon, and is the dreaded foe of man, monkey, quadrupeds and small rodents. Deer are also hunted, alligators and boas sometimes devoured, and the animal is often expert in catching fish. It hunts both by pursuit and by leaping from ambush. There is some reason for believing

JAGUAR

that there are three species of jaguars — a large and a small spotted form and a large, black variety which attacks the tapir.

Jaipur (*jī-po͝or*) or Jeypur, one of the Rajputana states, feudatory to the British crown; and also a walled city 850 miles northwest of Calcutta, India, and the capital of the native state of the same name. It is a handsome, well-built city, and was founded in 1728. In it are the maharajah's palace and college, a school of art, an observatory, a mint and many mosques and temples. The beautiful Ram Newas gardens, covering 70 acres, are a fine park. Its business is chiefly banking. Population 160,000. The state has an area, including feudatories, of 15,579 square miles, with a population of about 3,000,000.

Jamaica (*jä-mā'-kä*), first called Xaymaca, "land of springs," one of the largest of the West India Islands and the most important of the Antilles belonging to Great Britain. It lies some 90 miles south of Cuba, and its area is about 4,200 square miles. Its greatest length is 144 miles, and its greatest width is 50 miles.

Surface and Cities. It is crossed from east to west by a heavily timbered ridge called the Blue Mountains, which rise 7,400 feet. Excellent harbors are everywhere found. The best is in the southeast, in the deep basin which washes the most spacious and fertile of the plains between the hill-country and the coast. Around this inlet and within a few miles of each other are the largest towns: Kingston (population 50,000) and Spanish Town, the old capital (population 5,500). Here also is Port Royal, one of the chief cities of the West Indies before the great earthquake of 1692.

Climate and Products. The climate varies from the torrid belt of the coast to the temperate region of the Blue Mountains, which have become favorably known as a resort for invalids. Vegetation is luxuriant. The primeval woods are fast disappearing, but there still are many valuable trees, as balata, mahogany, logwood, ebony, cocoanut and other palms. The exports are chiefly dyewoods, fruits (oranges, lemons, bananas and pineapples), sugar and coffee, allspice and cocoa. Jamaica has 817,211 acres under cultivation — 246,373 under tillage and 570,838 under pasture.

Education and Defence. In addition to government training-colleges for both sexes and to high-schools, Jamaica supports nearly 700 government elementary schools and industrial institutions. Port Royal is strongly fortified, and, besides the garrison of regulars (English), there are a local artillery militia and a rifle corps.

Jamaica was discovered by Columbus in 1494, and was settled by the Spaniards in 1509. It was conquered by an expedition sent out by Oliver Cromwell in 1655, and was ceded to the English in 1670. In 1661 a representative council was established; but this was abolished in 1866, and in 1884 a partially elective legislative council was instituted. There is no established church; all the chief religious denominations, however, have their places of worship. There are numbers of East India immigrants, besides Negroes and Chinese on the island. The population by census of 1911 was 832,000. Jamaica now has a railway nearly 200 miles in extent, open and running. Under the government of Jamaica are the Cayman, Turks and Caicos Islands, part of the Bahaman group. See the *Jamaica Handbook*, published by the government printing-house, Kingston

EDMUND J. JAMES

James, Edmund J., a writer on political economy and an American educator was born at Jacksonville Ill., in 1855. He attended Northwestern University; and afterwards studied at Harvard, Halle, Leipzig and Berlin. He has in succession been principal of Evanston (Ill.) High School and of the State High School at Normal (Ill.), professor of administration and finance in the University of Pennsylvania, professor of administration in Chicago University, and (1902) president of Northwestern University (Ill.). He now is president of the University of Illinois at Urbana. He has written *An Outline of a Proposed School of Political and Social Science, Chairs of Pedagogics in our Universities, The Relation of the Modern Municipality to the Gas-Supply, Our Legal Tender Decisions, The Education of Business Men in Europe, The Growth of Great Cities*, etc.

James the Great, held to be the oldest of the brothers of Jesus, was stoned to death by command of the high priest Ananias in 62 A. D. He is the James mentioned in *Acts* xii., xv., xxi. and *Gal.* i. 19, who was the head of the Christians at Jerusalem and, according to one authority, was called the Just. He is held to be the author of the epistle which bears his name. His epistle is the first of what are known as the *catholic* epistles, that is, those addressed to no one person or church but "to the twelve tribes scattered abroad." It was written not later than 50 A. D., certainly before the destruction of Jerusalem in 70 A. D.

James I of England and VI of Scotland, the only son of Mary, Queen of Scots, and

Henry, Lord Darnley, was born in Edinburgh, June 19, 1566. When his mother was forced to resign the crown, James was proclaimed king of Scotland, July 29, 1567. The training of his childhood was under the care of the earl of Mar. His tutor was the famous scholar, George Buchanan. In 1578 the earl of Morton, then regent, was driven from power, and James assumed full control. The new government was unpopular, and Morton was once more made regent. He was at length condemned and executed as one of the murderers of Lord Darnley. In the winter of 1589 James went to Denmark, where he married Princess Anne, daughter of King Frederick II. By the death of Elizabeth in 1603 James succeeded to the throne of England. He soon became unpopular with his new subjects. The anger of the Roman Catholics toward him, because of his severities, led to the famous Gunpowder Plot (which see). He really governed through his favorites, Kerr and Buckingham, both of them unpopular; and England's prestige as a power, which had been gained under Elizabeth, soon disappeared. He has been described as two men in one — "a witty, well-read scholar, who wrote, disputed and harangued, and a nervous, driveling idiot who acted." He was called by Henry IV of France "the wisest fool in Christendom." James died on March 27, 1625. See Macaulay's, S. R. Gardiner's and Ranke's histories; also Goodman's *Court of James I* and Scott's *The Fortunes of Nigel.*

James II of England and VII of Scotland, second son of Charles I and Henrietta Maria, was born on Oct. 15, 1633. In 1643 he was made duke of York. During the Civil War he escaped into France. He served in the French and Spanish armies. In 1661 he married Anne, daughter of Lord-chancellor Hyde. When Charles II died, James was made king, Feb. 6, 1685. He was most unpopular, because he was a Roman Catholic and utterly failed to understand the temper of the English people. He levied, without warrant from parliament, from the customs-duties. He became, as his brother Charles had been, a mere puppet in the hands of the French king, Louis XIV. The Covenanters of Scotland were persecuted even worse than they had been when Charles had handed Scotland over to the tender mercies of James. After the unsuccessful rebellion of the king's nephew, Monmouth, came the "Bloody Assize," the court held by the wicked Jeffreys, in which 320 persons were hanged. Such acts roused the anger of the nation to the highest pitch. An invitation was sent to William, Prince of Orange, signed by seven of the leading English statesmen, to come over to England and take the crown and throne. At the head of a powerful army William landed at Torbay on the English Channel, on Nov. 5, 1688, and began his march toward London. He was everywhere hailed as a deliverer, while James was deserted, not only by his ministers and troops, but even by his daughter, Princess Anne. The king had feared danger, and had sent his wife and infant son to France, where he soon joined them at St. Germain. He was kindly received by Louis XIV, who settled a revenue upon him. Next year he made a hopeless attempt to regain his throne, with an army furnished by France. He invaded Ireland, but was totally defeated at the battle of the Boyne (1690). He died at St. Germain, Sept. 6, 1701. See Macaulay's, Ranke's and Lingard's histories and Burnet's *History of his Own Time.*

James III of Scotland, the son of James II and Mary of Guelderland (Guelders), was born in 1452. On the death of his father the government was conducted by his mother, aided by the wisdom of Bishop Kennedy. Upon her death in 1465 the young king came to power. He all his life, however, was under the influence of scheming favorites. Among these was a man named Cochran, who had been a mason. Through his influence the duke of Albany, the king's brother, was forced to fly from the kingdom, having been charged with witchcraft; while the earl of Mar, another brother, died in prison. The rule of Cochran and other low-born favorites led to a rebellion among the nobility. The result was that they were hanged. The king himself was shut up in his castle at Edinburgh. James's love for literary pursuits drew upon him the contempt of the warlike and ignorant nobles. An attempt was made to take the throne from him. James led out the royal army to defeat the rebels, near Stirling, but was himself overcome and obliged to fly. He was thrown from his horse and murdered, June 11, 1488.

James IV of Scotland, the son of James III and Margaret of Denmark, was born on March 17, 1472. The rule of the new king, who came to the throne after the death of his father, gave promise of being both vigorous and popular, while his personal beauty and open frankness won the hearts of his people. He exhibited energy and sense in the management of public affairs, in vindicating the law and punishing crime, in encouraging ship-building and in developing agriculture and manufactures. In 1503 the king married Margaret, oldest daughter of Henry VII of England, an alliance which led to the union of the two crowns just 100 years later. Henry VIII came to the English throne in 1509, disputes followed, and James invaded England. He was met by the earl of Surrey, and in the battle of Flodden, Sept. 9, 1513, the king and many of his nobles were killed. He was 46 years old, and had reigned 26 years. James was only in his 16th year when he was persuaded to join the barons in their rebellion against his father. The remorse which he felt when he learned that his father had been cruelly murdered is shown by his wearing an iron chain about his waist and doing many other things by way of penance for his guilt. He possessed great ability, but was headstrong, obstinate and overfond of pleasure. See Gregory Smith's *Days of James IV*.

HENRY JAMES, JR.

James, Henry, American novelist, essayist and one of the most cultured and polished of writers, was born at New York, April 15, 1843. He is the son of Henry James, religious author and lecturer, and like his father has become noted as an author. He was educated at New York, Geneva, Paris and Boulogne, and in 1862 entered Harvard Law School. He soon began to write magazine stories. His first novel was *Roderick Hudson* (1875). He is known as eminent critic as well as novelist, and has given us such clever studies as *French Poets and Novelists*, *Partial Portraits* and a monograph on *Hawthorne*. Perhaps his best story is *Daisy Miller*. Others include *The American*, *The Europeans*, *The Bostonians*.

James River, an important river formed by two streams in the west of Virginia. It runs its entire course in the state, passing Lynchburg and Richmond and widening into an estuary 60 miles before reaching the Atlantic at the southern end of Chesapeake Bay. Its length is 450 miles and for some distance it is navigable for large steamers. Its chief branches are the Appomattox on the right and the Chickahominy on the left. These streams were made famous by the battles which took place there in 1862.

James Stuart, called The Old Pretender, the son of James II and Mary of Modena, was born on June 10, 1688. His father had been driven from the throne by William of Orange, and died at St. Germain, France. Soon after his death a herald made his appearance before the palace-gate, and, with the sound of trumpets, proclaimed in Latin, French and English: "James III, king of England and Scotland." The boy was received at the French court with all the honors which his father had received before him. In London a few nobles remained faithful to the memory of his father. These made haste to proclaim James III. But the opposition was too strong, and in all parts of the kingdom the people passed resolutions of fealty to William of Orange and of defiance to the king of France and his protégé, the young prince. His life was one of constant expectation and disappointment. At times the throne seemed just within reach, but as often slipped from his grasp. In 1719 he married Marie, granddaughter of John Sobieski, king of Poland, by whom he had a son known in history as Charles Edward, The Young Pretender. He died at Rome, Jan. 12, 1766. See J. H. Jesse: *Memoirs of the Pretenders and Their Adherents*.

James, William. He was born in New York City in 1842, the son of Henry James, the theologian and follower of Swedenborg, and the brother of Henry James, the well-known novelist. After an education in private schools and by private tutors in America and Europe, he attended Lawrence Scientific School of Harvard, and received his M. D. from that university in 1870. Since then he has received the LL.D. from Princeton University. In 1872 he was appointed instructor of anatomy and physiology in Harvard University; but soon changed to philosophy and then to psychology. It is in the last field that he has made a permanent name. Recently he has turned his attention chiefly to philosophy, and is the exponent of what is known as pragmatism, the theory that every doctrine must be interpreted and judged in terms of the effect its adoption has upon the action of individuals. In his psychological work his most notable contribution is the so-called James-Lang theory of the emotions, which maintains that emotions must be regarded as the result of those instinctive bodily movements which are commonly regarded as the expression and result of the emotions. He is distinguished among scientific writers for his bright and pleasant style and for the many forceful, picturesque expressions he has coined. It has been said that Henry writes fiction as if it were psychology, and William writes psychology as if it were fiction. His works are *The Principles of Psychology*, an epoch-making work; *The Will to Believe*; *Human Immortality*; *Talks to Teachers on Psychology*; *Varieties of Religious Experience*, a work that opens a new era of thinking in its line; and *Pragmatism*, an account of his philosophical doctrine. Died Aug. 26, 1910.

Jame'son, Leander Starr, best known as the leader of a rash and ill-considered raid into the South African Republic (Transvaal) in 1895, was born at Edinburgh in 1853, and educated as a doctor of medicine (London, 1877). From 1891 to 1895 he was administrator of Rhodesia; but on invading Transvaal with 600 men upon his own responsibility, during the *Uitlander* agitations, he was captured by the Boers; and sentenced by the British government to 10 months' imprisonment. He afterwards served in the Boer War with the British forces, became a member of the Cape Colony Parliament and director of the De Beers Company.

and the British South African Company; and in 1904 he became premier of Cape Colony. In 1908 he resigned, the Dutch having outvoted his party.

James'town Exposition, The, which was held in Virginia in 1907 to celebrate the 300th anniversary of the settlement, recalled in the first place something of the early history of the south. The exposition stood in wide grounds which covered some 500 acres, on the shore opposite Old Point Comfort, where the pioneers from the *Godspeed*, the *Susan Constant* and the *Discovery* landed three centuries ago. The locality is one of the richest in historical associations, even of the War of Independence and the Civil War. The historical collections in the exposition included many exhibits from the north and west and some interesting contributions from the Colonial Dames, the Daughters of the American Revolution and the United Daughters of the Confederacy. There were many exhibits from the south itself, including a series of portraits of the governors of Virginia. Then again, near by in Hampton Roads, there were seen not only a fleet of vessels from the navies of many nations, but the old ironclads *Merrimac* and *Monitor* reproduced as they appeared in their famous duel in the Civil War. Among the other features may be mentioned many valuable documents sent by the state departments; an arts and crafts village where were shown the processes of working in copper, iron, silver, pottery and wood; a good aquarium of both sea and fresh-water fishes; a series of boat-races, motor-boat races and air-ship trials; and an educational exhibit of the standard results of school work as well as a model school in which modern methods of teaching could be studied in their operation.

Jamestown, a city of Chautauqua County in western New York, on Chautauqua Lake, 58 miles southwest of Buffalo by rail. It is on the New York, Lake Erie and Western and Lake Chautauqua railroads. It has all the adjuncts of a progressive city, including electric lights, electric railways, good schools and adequate water-works. It has manufactures of pianos, furniture etc. Its industries also embrace the manufacture of alpacas, woolen and worsted goods, plush stuffs, boots and shoes. Power is furnished from two electric plants, and the natural gas supply leads to extensive use of gas-engines. Jamestown has 25 churches, 11 grade-schools, a high-school, a parochial school and night-schools conducted by the city and also the Y. M. C. A. Prendergast free public library has an excellent collection of paintings besides 17,500 volumes and 5,000 reference-works. Population 31,297

Jamestown, Va., is situated on a small peninsula, which lies off the northern bank of James River, about 35 miles above where this river broadens into Hampton Roads and empties into Chesapeake Bay. As early as 1526 some Spaniards tried in vain to settle in the neighborhood. In 1607, on May 13, three British ships, sent from London by the London Company, under Captain Christopher Newport, landed their crews and about 105 colonists upon this low-lying peninsula, where it was hoped to rest secure from Indian attacks. Edward Wingfield was chosen president by a council of six who had been appointed by the London Company. The ships sailed for England, leaving but a scant and wretched supply of food. The Indians threatened the colonists, while disease and mutiny were added to hunger. This year occurred Smith's romantic adventure with the Indians, which seems to have resulted in much good for the colonists. But in spite of Smith's resourcefulness only 38 survived till the ships returned with more colonists and with provisions. In 1608 Smith was chosen president, and it was chiefly due to his wonderful courage and skill in dealing with the Indians that the colonists were saved from massacre and that corn was brought in for food. The colonists for the most part were gentlemen and tradesmen, and could help themselves but little in the wilderness. Thus they struggled through the winter of 1608. In 1609 Smith suffered a terrible wound that compelled him to sail for Europe. An inferior grade of colonists arrived, who neither could work nor wished to try. The winter of 1609 therefore was a time of terrible suffering, known as the Starving Time. Of 400 men and women that Smith left only 60 survived till spring, when a small fleet that had been delayed by storm and wreck arrived with some little provision. The colonists, new and old, decided to abandon the settlement; but as they sailed down the river, they saw, far out in Hampton Roads, the long-boat of Lord Delaware's ship, which told of a large and well-equipped fleet at hand. Sir Thomas Dale was then appointed high marshal, and with great firmness and wisdom brought peace to the colonists, compelling all to work by removing the privilege of sharing in the common store of the colony. A deputy governor, Argall, ruled despotically for two years (1617–19), so that, when George Yeardley was sent out as governor to supersede him, the people demanded self-government to secure them against such danger in future. Accordingly a House of Burgesses was summoned, the first representative assembly in America. This incident closes the separate history of Jamestown, which henceforth lived only as part of the colony and then the state. The town itself was burnt by Bacon (1676) and then abandoned as unhealthy; but a tower remains to mark its site, which now is largely under water.

Janauschek (*yä'nou-shĕk*), **Fanny,** was born at Prague, Bohemia, July 20, 1830. She was devoted to the stage from childhood, and at an early age showed great artistic talent. Her life as an actress began, with much success, at Cologne. She appeared in the principal cities of Germany, Great Britain and the United States. She was an actress of great power, but lacked the finer touches of her art. She died in 1904.

Janes'ville, Wis., the capital of Rock County, 71 miles southwest of Milwaukee and 91 northwest of Chicago, at the junction of four railroads, lies mostly between bluffs in the narrow bottom land of Rock River, which is crossed here by four bridges. The river is also crossed by dams, and its water-power is utilized in the numerous manufactories. There are a number of flour, cotton and woolen mills, two foundries and over 50 factories of various kinds. Janesville is the center of a large tobacco-growing district, and large warehouses for sorting and packing tobacco furnish employment to many laborers. It is the seat of the Wisconsin School for the Blind, and has public-school property to the value of nearly $260,000. Population 13,894.

Janizaries (*jăn'ĭ-zā-rĭz*) (a Turkish word meaning new soldiers), the first regular standing army of the Turks, formed by Sultan Orkhan in 1330. They mainly were young Christian prisoners, who were compelled to believe in Mahomet. In 1362 the army numbered 10,000, and for some time prisoners were added, but the force became privileged and honored, so that many young Turks sought to be admitted into their number. At the head of the force was an *aga* or chief. In peace the janizaries acted as police, and in war they served on foot, being noted for bravery. The sultan's bodyguard was formed of them. Their history is replete with conspiracies, assassinations of sultans, viziers and agas. More than one sultan attempted to reform or disband them. At last Sultan Mahmud II, in 1826, having organized a new force after the pattern of the European armies, displayed the flag of the prophet, and after hard fighting drove the janizaries into their barracks, which he burned, 8,000 perishing in the flames. Not less than 15,000 were executed, and more than 20,000 were banished. By a proclamation, June 17, 1826, the janizary forces were finally disposed of, and their place taken by the *nizam*, the modern regulars, formed on the European plan. See Poole's *The Story of Turkey.*

Jan'uary, the first month of the year in the Gregorian calendar. It was named from Janus, the god who in the Roman mythology presided over the origin of things. To the Scandinavians it was the month of Thor. January was in England made the first month of the year by an act of parliament in 1751.

Janus (*jā'nŭs*), an old Italian god, who was supposed to guard the gates of Rome. In every undertaking the pious Roman prayed for the blessing and help of Janus. He is represented with a scepter in his right hand and a key in his left, sitting on a golden throne. He has two faces, one youthful and the other aged, the one looking forward and the other backward. Numa devoted to him the passage close by the Forum at Rome. This passage, often called a temple, was simply a gateway, which was sacred and contained the statue of Janus. This was open in time of war, and closed in time of peace. So constant were the Roman wars, that this gateway was only three times closed in 700 years.

Japan'. The Russo-Japanese War of 1904-05, with its astounding results and the consequent readjustment of world-policies in the Far East, is of so recent a date that it is difficult to realize that a half century ago the "Empire of the Rising Sun" was *terra incognita*, its image in the popular mind colored by the tales of Marco Polo. It seems incredible that the Japanese should have overcome oriental conservatism and inertia and leaped forward 500 years in the space of 50. The awakening was national, spontaneous, self-directed; western civilization was assimilated intentionally, intelligently and so quietly that the rest of the world was scarcely aware of it. It was confidently expected that Russia would occupy Pekin and Seoul, and the partition of China among the great powers was considered to be a question for settlement in European capitals. Japan's beautiful and distinctive arts and crafts, her exquisite manners, her elaborate social and religious systems, all proving a very ancient civilization, secured for her no substantial recognition. Her eager ambition and efficient adoption of advanced ideas, devices and scientific principles were looked upon as the activities of a precocious child, from which little achievement was to be expected. Up to 1895 and her successful war with China, Japan was humiliated by the maintaining of consular courts with jurisdiction over foreign residents; and hampered financially and exploited by the nominal duties that foreign powers chose to pay in the treaty ports.

Japan was like a man laboring with one hand tied behind his back. The leap into the arena was, therefore, all the more startling. When Port Arthur was fired upon, in February, 1904, and troops landed in Korea, the world cried: "Bravo! magnificent but suicidal." It was thought that the Great Bear of the north would make just one mouthful of the plucky little oriental terrier. A year later, when Japanese bonds were eagerly bought in London, Paris and New York, Marquis Ito, the Japanese Bismarck, is reported to have commented upon the singular fact that western civilization still made force of arms the standard of equality among nations. To-day there is a very general disposition to accept Japan at her own estimate as the British Empire of the Far East.

Physical Features. The situation of the Japanese archipelago of four large and nearly 4,000 small islands, off the eastern coast of temperate Asia, is similar to that of the British Isles off the western coast of Europe. Its area of 175,540 square miles is one-fifth greater, its population of 51,000,000 one fourth more. Its climate, running from the Tropic of Cancer to 50° north, is one of wider range, while its more varied surface gives it greater extremes of heat and cold in every part. The separation from the mainland, on the crest of a 900 mile-long, crescent-shaped mountain-chain that rises from the bed of the ocean, has deeply imbued an imaginative people with a sense of special creation. This colors their literature and art; their manners and customs and religion, and nourishes a fanatical patriotism. The island empire has an almost uncanny beauty of plain and valley; guarded by wooded ridges, watered by cascades, overlooked by the sacred, snowy peak of Fujiyama, flooded annually by rains and warmed by genial suns that awake myriads of flowers and butterflies, and girded by wide defensive seas.

Vegetable and Animal Life. The natural growth varies from palms and bamboos of southern valleys to the oaks and pines of the mountains of Yezo; the crops, from the camphor-gum of Formosa to semitropical tea and rice and mulberry groves for the silkworm; to tobacco, wheat and barley; and up to the wild grasses and reindeer-moss of Sakhalin. Of native wild animals there are foxes and wolves, boars and black bears, none of them numerous. But of birds there are the species common to the continent beside millions of waterfowl, heron and crane and gulls, ducks and geese and reed-birds that make any bit of coast look like the panel of a painted Japanese screen.

Minerals. The sterile, rocky ridges are underlaid with iron, worked for ages into swords for the *samurai,* and with coal dug out since the awakening, for warship, locomotive and factory. There are some gold and silver and copper, a great deal of sulphur and graphite and ancient beds of kaolin that centuries of porcelainmaking have failed to exhaust. Yet Japan is a poor country in proportion to the population she must support. A large percentage of her area is infertile. History, however, proves that countries, like individuals, usually prosper in inverse ratio to their natural wealth. Like Great Britain, Japan is being forced by necessity into manufacturing and trade and immigration, to take toll of the world.

People and Customs. The philosophical students of history look for analogies. To them it is an equally striking fact that the Japanese, like the English and the people of the United States, are a mixed race, for the mixed races have been the conquerors. The Japanese are an amalgamation of Mongols, Tartars, Koreans and Malays with the aboriginal Ainu, of whom 12,000 still survive, making a race superior to any other yellow people. Their stature is that of southern Europe; their complexion lighter and clearer than the Chinese, their eyes less oblique; their extremities more delicately fashioned. In youth their cheeks are rosy. Their teeth are even and white, their hair fine, abundant and coal-black. It is almost superfluous to speak of the exquisite courtesy and cheerful demeanor of the Japanese, of their personal cleanliness, of the phenomenal good temper of the children. A Japanese baby is said never to cry, not because of an Indian stoicism, but from sheer happiness and well-being. Japan is the children's paradise, where a harsh word is never spoken, obedience never refused.

European dress and habits of living have made little headway. They have been adopted in the imperial court, in the army and navy and at the university and colleges, but 95 per cent of the men still cling to their long robes, girdled with brocade, their loose jackets and wooden-soled pattens. The jinriksha boys run bare-legged in the streets; the farm-laborers wear knee-breeches of blue or white cotton and bamboo umbrella-hats; the women and children their wide-sleeved kimonos and gorgeous silk obis, tied into huge butterfly-bows in the back. The architecture peculiar to the land is likely to be retained, for it is the offspring of the earthquake — light, flat, elastic — bamboo, dove-tailed woodwork and paper-screens are not easily shaken down. Even the temples palaces and tea-houses are of these materials, richly gilded and painted and anchored by heavy, overhanging roofs. The floors are covered with thick, padded straw-mats and divided into temporary rooms by sliding screens. There is little furniture except tables and trays of bamboo and lacquered wood. The ornaments are inscribed rolls of silk, embroideries, art potteries, cloisonné enamels on brass and gold-lacquer art-objects, brought out a piece at a time for admiration. The land wears a holiday air, as of a summer show, clean, gay, fragile. Even the charcoal braziers used for cooking and heating the bath seem like devices for picnic use. The frequent fires are not a great calamity, for the buildings are quickly and cheaply replaced.

The holiday aspect of Japan is increased by the semipublic outdoor life of the people and by the profusion of tiny gardens. The rice and fish that form the staple food are easily cooked, as well in an arbor as in a house, and tea is brewed anywhere. Fruits, nuts, seaweed, beef, beans, poultry, eggs, wheat-bread and confections are used by the wealthy, and the introduction of dairy cattle is making milk and butter familiar. The wealthy enliven the dinner hour with the professional music and dancing of pretty *geisha* girls. Then they go to the theater in jinrikshas, and listen to plays all whose characters are acted by men and that, like our serial stories, are "to be continued." Or they go to a public tea-house, a temple-festival or a flower-show. They are fond of travel, picnics, stories and poetry. On holidays the streets are gay with flags and paper-lanterns. The boys have their kite-flying day, as hilarious as our Fourth of July, and the girls their feast of the dolls. The entire population of city and country turns out at the flower-festivals, of cherry-blossom time in April, and the chrysanthemum shows of November. The essential refinement and gentleness of the Japanese are shown by the character of their pleasures.

Religion. The explanation of much that is strange in Japanese customs and ideas is to be found in their two principal religions: Shintoism and Buddhism. The first is ancestor-worship in the broadest sense, and makes for family affection and loyalty, civic duty and national patriotism. It has many temples, few ceremonials and no idols. It is not inconsistent to be a good Shintoist and also a good Buddhist. Buddhism is the predominant religion, as it is of China and Korea. Its underlying principle is that all life is eternal and sacred; hence the universal kindness to animals, birds and even insects and the indifference to death shown by Japanese soldiers. The Buddhist virtues are self-control, kindness, patience, duty. St. Francis Xavier introduced Christianity in the 16th century, but it was afterwards forbidden. Two hundred and fifty years later, when the country was opened, 25,000 Roman Catholics were found to have survived persecution. Now all religions are permitted. The Presbyterian and Congregationalists have flourishing missions, the Greek Catholics a church, and the Y. M. C. A. an organization. The Roman Catholic and Protestant converts together number scores of thousands.

History. The early history of the Japanese, as of all ancient peoples, is shrouded in myth. Like the Greeks and Egyptians their origin is ascribed to deities, and the pedigree of the present reigning family is traced back to the sun-goddess. The emperor Jimmu, 600 B. C. is considered an historical personage. It was not until the 10th century of our era, however, that true historic records began to be kept. The Buddhist religion, the literary language and printing, with many of the arts of Japan, were introduced from China. But the political system was a native, free evolution, unaffected by outside influence. Originally the active rulers, the mikados gradually resigned leadership to a military chieftain or shogun, they retaining their prerogatives and semi-sacred character in a life of enervating seclusion. Japan became a hermit-empire, the inhabitants forbidden to leave the country under pain of terrible punishments. Until 1543 communication was held only with China and Korea. For nearly a century thereafter the Portuguese and the Dutch East India Company carried on a precarious trade with Nagasaki. But from 1638 to 1854 no foreign vessel anchored in any other harbor of Japan.

In these two centuries the emperor was a sacred recluse in the temple-palace at Kioto, the shogun military dictator in Yedo (now Tokyo). Troops were supplied by 250 *daimios* or feudal lords of great estates, each of whom had bodies of armed retainers known as the *samurai* Shogun, daimio and samurai became hereditary in families and formed a military class that dominated the empire. The mass of the people were agricultural laborers and artizans. Protected by their masters, unable to leave the estate where they were born, unhurried, undisturbed by the wars of clans, all their original genius and aspirations were turned back on their work. They acquired monumental patience, tactile skill and an exquisite exuberance of fancy that fills the world with wondering admiration of their work to-day. It was in the middle ages of Europe that the artist was set free in the artizans who built the great cathedrals and filled them with paintings and sculptures. So not all was evil in Japan's hermit centuries that brought a dozen native arts to such perfection. Unnoted, these millions of nameless toilers filled the land with splendor, while the sacred mikados dozed away the idle generations.

At Kioto the shoguns became dictators and the daimios rebelled against their despotic rule. Since the daimios furnished the revenue and the soldiers, they demanded a voice in affairs, as did the nobles of England when they wrested *Magna Charta* from King John. Five centuries in arrears with Europe, Japan was enacting the drama of civilization. With brief intervals of quiet the country was in a state of civil war from 1603 to 1854 without dislodging the shogun, because the daimios could never stop fighting each other long enough to unite against the common enemy. He was tottering to a fall, however, when Commodore Perry, U. S. N., arrived in Tokyo in a war-vessel (1854), and demanded that the harbor be opened to American trade. Mr. Townsend Harris, the first American envoy, had a letter from President Fillmore which he refused to deliver to anyone but the ruler of the land who was thought to be the shogun. Then Admiral Stirling steamed into Nagasaki with Lord Elgin aboard to present English demands. The shogun saw an opportunity to bolster his rickety throne by concessions to these foreign invaders. This so incensed the daimios that the land burst into a conflagration of revolution. Within the next 10 years 18 nations forced an entrance into Japan. The powers at length discovered that they had been hoaxed and that the sun and center of authority was in the hermit emperor at Kioto. Their support withdrawn, the shogun abdicated, and 16 year old Mutsuhito was swept out of his spiritual retreat and onto a very temporal throne in Tokyo. See MUTSUHITO.

Modern Japan. The history of modern Japan dates from 1868, the 'Era of Enlightened Peace' as it is known to the Japanese. The 15 years since the western powers forced an entrance had united the country, brought forward a number of remarkable men and fitted them for the task of reorganizing the empire. That Japan was far advanced toward political and social changes at the time was shown by the instant advantage taken of the favorable opportunity. Incensed by the foreign invasion, but far from being frightened by it and, indeed, accepting it and determined to turn it to Japan's advantage, scores of daring young nobles stole out of the country in the 50's, a thing still forbidden. In the spirit of scientific explorers they went to observe the occidental world. They travelled, attended colleges, studied governments, inventions and institutions. There seemed no bias of prejudice in their minds that prevented the appropriation of any idea or device useful to them. In a dozen years they returned to Japan to lead the revolution and to form the mind of their holy recluse, the young emperor. Needing time and peace more than independence to mature their plans, they submitted with misleading docility to the impositions demanded by the powers, for a quarter of a century, until they were strong enough to strike a blow for liberty and to win the respect of the modern world.

The first thing the boy-emperor did was to receive the foreign envoys and to permit consuls to reside in the treaty-ports. The second was to appoint Japanese representatives in foreign capitals and ports with instructions to keep their eyes open and report all they saw. Next, he rode through the capital in an open palanquin, and forbade even a coolie to prostrate himself. Then he announced his intention of establishing a constitutional, representative government as soon as the people should be educated in the system of public schools to be opened. The next year he called the daimios to Tokyo and demanded of them, as a patriotic duty, that they give up their feudal estates, titles and privileges, and release their samurai to form a national standing army. This was a bitter dose, and the daimios did not all swallow it willingly. None the less the thing was done, with the result that Japan, like Germany almost simultaneously (1871) became a strong, centralized empire by a federation of states. A new nobility in five orders (princes, then marquises, counts, viscounts and barons) was created from complaisant daimios, including the chastened shogun, and from the patriots and statesmen who formed the new empire. These were to make up the membership of the house of peers under the constitutional government.

The promises made in that trying, formative time were carried out to the letter. For 22 years the emperor remained, in theory, an autocratic ruler, but in fact he acted under the advice of the imperial council, and the machinery of a modern government was installed a wheel at a time. Within a few years courts of justice were established, and public schools from kindergartens to a university were opened. The army was organized on the model of that of Germany; the navy after that of Great Britain; the department of justice and police system after that of France. The United States and England furnished the pattern for the constitution, the model for the legislative and executive functions of government. In 1875 an appointive, deliberative body was formed to discuss measures and make recommendations to the emperor and his council. It served as a school to educate future legislators. In 1890 the constitution, on which Marquis Ito and the elder statesmen had worked for 10 years, was proclaimed, and the first election ordered. The franchise was not universal, but was restricted by educational and property requirements. It is being extended gradually. The first parliament was opened with 364 peers and 375 members of the House of Representatives. Marquis Ito was called to form a new cabinet in harmony with the people's will.

It was 1895 before the disabilities imposed by foreign powers were removed and Japan had full, internal jurisdiction or adequate revenues. Earthquake, floods and failures of the rice-crop visited her. A war with China was fought to a successful issue, but aside from greater internal independence her victory brought her little advantage. She secured the cession of Formosa and the Pescadore Islands, but the great powers united to check her ambition on the mainland. She was forced to abandon Shantung province, which she had conquered, and the fortified peninsula of Port Arthur, which she had carried by brilliant assault. Within two years, through treaties, Russia occupied Manchuria and was entrenched in Port Arthur, and England and Germany were in Shantung, the three controlling the Gulf of Pechili, the approach to Pekin. Japan felt that her national existence was threatened. But government and people were so quiet that the western world thought her helpless and acquiescent. Viewed in the light of after events 50,000,000 people now seem to have been in a conspiracy of silence during 10 long years of preparation for war. Russia was the only power whose occupation of Chinese territory was backed by land forces and fleet. The Japanese minister in St. Petersburg made persistent demands that Russia keep her promises to get out of Manchuria. Diplomatic negotiations dragged through two years. Twice Russia set dates for the evacuation, but it was only to gain time to strengthen her fortifications and concentrate troops. Suddenly, when Russia had a quarter of a million soldiers in Manchuria and Japan was expected to back down, diplomacy was abandoned.

On the night of Feb. 8, 1904, Japanese warships fired on Port Arthur and bottled up the crippled Russian fleet. Within two weeks Japan was landing troops at Chemulpo, Korea, the port of Seoul, far up in the Yellow Sea, capturing or sinking two Russian cruisers. Then followed the swiftest, most business-like war that the modern world has ever seen. The fortified Yalu River, bounding Korea, was crossed on May 1 After the battle of Liao-Yang in August the Japanese forces divided, one moving on Mukhden, the other attacking the defenses of Port Arthur. Port Arthur and the shattered fleet in the harbor were surrendered on Jan. 1, 1905, after a five months' bloody siege, during which the world stood aghast at the fanatical patriotism and military genius of the Japanese. On the 12th of March Mukhden fell, the Russians, with a loss of 150,000 out of 375,000 men, retreating 160 miles northward. On May 27th and 28th, the vessels of the second Russian fleet, sent to the relief of Port Arthur from the Baltic Sea and flying to the safety of Vladivostok harbor, were captured or sunk in the Japan Sea. It furnished the world its first example of a great naval battle in open sea, with modern battle-ships and guns. The war lasted only 16 months and ended in complete rout for Russia. The financial resources of both nations were practically exhausted. Through the friendly intervention of President Roosevelt a treaty of peace was signed in Portsmouth, N. H., August 29, 1905. Russia surrendered all claims in Manchuria and ceded the southern half of Sakhalin Island to Japan. Japan has since established a protectorate over Korea without protest from the powers, is developing the Russian railroads in Manchuria, and continues to occupy Port Arthur. She has added some 20 Russian vessels to her navy, and the names of Admiral Togo Field-Marshal Oyama and Generals Kuroki, Nogi and others to the world's roll of military and naval heroes.

The progress of Japan is still proceeding at a rapid pace. Her wealth is estimated (1911) at $6,410,403,500 and one-fourth of her national debt of $1,442,581,237 is held in western capitals. Her imports and exports exceed $500,000,000, about a third of that sum representing her trade with the United States There were no schools; now there are 30,000 elementary schools, 150 high schools and academies and 40,000 students in the universities and colleges for professional training. Large numbers of students are in universities abroad, a policy in part supported by the government. The samurai of the daimios were scattered, warring clans who were humorously described by an early traveller as wearing "iron-pot helmets with the lid over the face, chain and lacquer armor, and led by a chief in a palanquin with a fan." The army to-day excites no one's sense of humor. Its peace-footing is 220,000; its war-footing 800,000. There are 193 vessels in the navy and 36,000 men. The empire has its own arsenals and shipyards, and all the harbors are fortified.

In 1875 the imperial revenues were only $30,000,000. In 1912 they were $286,445,000. Vast sums have been spent in internal improvements and developments, Japan comparing in this respect with Mexico. A necklace of lighthouses has been strung around the islands, and the waters charted, making navigation safe. Over 5,000 miles of railway have been constructed. Telegraphs are established throughout the empire, and cable connection made with Korea and China. Commercial steamship lines to the United States, China, Australia and the Philippines have been established, partly with the aid of government subsidies. The latest machinery is used on farm and in factory, and this machinery, at first imported, is now produced in Japan. Engineers, mechanics, learned professors, experts in every line, once sought abroad, are now displaced by native talent. Japan's population has increased from 40,000,000 to 51,000,000 in one generation. Tokyo, from a shogun's walled citadel, has changed to a modern capital as big as Chicago. Osaka has 1,226,590 people; Kobé is as big as Milwaukee, Yokohama as San Francisco, Hiroshima as New Orleans. Kioto, the sacred city of the hermit emperor, has 442,462 busy people, and the temple-palace is a museum of antiquities in a public pleasure park. Thousands of Japanese have emigrated to China, Korea and the Philippines. In 1900 there were 60,000 of them in Hawaii, 25,000 in the United States and as many more in British Columbia.

Nine tenths of the Japanese in the United States are coolies, and are concentrated in Washington, Oregon and California, chiefly in the cities, mines and fruit ranches where their competition with white labor aroused hostility. In 1906 the feeling against the Japanese was so strong in San Francisco that they were refused admission to the schools. Japan entered a protest against this discrimination, claiming that it violated treaty rights. The matter was compromised by admitting Japanese children, but excluding adults and by an amendment to the immigration laws excluding Japanese laborers from the United States. All matters of dispute were settled amicably, and Japan entertained the American squadron, on its cruise around the globe in 1908 with every demonstration of friendliness.

In the development of Japan the only subject touched upon by all writers with regret is the decadence of her distinctive arts. But one might as well deplore the decline of cathedral building in Europe. Conditions have changed irrevocably, and the artizan could not feed his family by working at a handloom to produce a web of crêpe or for months over a bit of ivory-carving, lacquer gold-painting or cloisonné, enamelled vase. Artistic feeling is so deeply embedded in the nation, however, that it is bound to find new expression. Cloisonné is said to be comparatively modern and to have been brought to perfection since the upheaval of 1868. The demand for embroideries, finer potteries and hand-made rice-papers for decorative use is on the increase, while the cheaper straw mattings, jute rugs and common potteries are disappearing.

See W. E. Griffis: *The Mikado's Empire;* Henry Norman: *The Real Japan;* Isabella Bird Bishop: *Unbeaten Tracks in Japan;* Lafcadio Hearn: *Kokoro and Japan;* W. T. Stead: *Japan and the Japanese;* and McCarty: *The Coming Power.*

ELEANOR ATKINSON.

Japan, Emperor of. See YOSHIHITO.

Jarnac (*zhär'näk'*), **Battle of,** was fought at the town of that name, in the department of Charente, France, March 13, 1569, between 26,000 Catholics under the duke of Anjou and 15,000 Huguenots under Louis, Prince of Condé. The latter was completely defeated.

Jar'vis, John Wesley, Anglo-American portrait-painter, was born in England in 1780. He was the nephew of John Wesley, who took him in charge in his infancy on account of the frequent absences of his father, who was a seaman. At five he voyaged with his father to America, and was left by him at Philadelphia. He obtained only a meager education, but displayed such marked talent for drawing,that it determined his future career. He worked as an engraver in New York, painting on glass in his spare time. He soon became successful and popular as a portrait-painter in oil. He painted the portraits of many prominent men, which now are in the city-hall of New York and in the gallery of the New York Historical Society. He died at New York in 1840.

Jasmine (*jăs'mĭn*), a flowering shrub, having most beautiful and fragrant blossoms. Its native home is not known, but it is now naturalized in many parts of Asia and Europe and as far north as Tirol and Switzerland. In more northern regions the jasmine is much grown in gardens, but does not easily endure severe winters. It is a shrub from six to ten feet high with evergreen leaves and white, waxy flowers. A well-known perfume is obtained from the jasmine.

Jason (*jā'sŭn*), the hero who commanded the Argonauts and sailed on a long voyage into unknown seas. Homer, the Greek poet, makes use of the story. It is the tale of the Argonauts (*q. v.*). Jason dedicated the *Argo* to Neptune, the god of the sea.

Jas'per, a mineral, regarded as one of the varieties of quartz. There are many kinds of jasper, some of one color, brown, red, yellow, green, white, blue or black, and some variously striped, spotted or clouded with different colors. It is a very abundant mineral, found in veins and imbedded in masses. It has been prized from the most ancient times for all kinds of ornamental purposes, and it takes a high polish. Many kinds are very beautiful, and it has not only been used for rings, seals and other small articles, but has been employed in the decoration of palaces. It is generally yellow, prettily mixed with brown.

Jasper, William, American soldier, was born in South Carolina about 1750. He enlisted during the Revolutionary War, and became a sergeant. At the attack on Fort Moultrie, June 28, 1776, Jasper distinguished himself by leaping to the ground under a shower of cannon balls and recovering the colors of the defenders of the fort, which had fallen outside and were in danger of capture. On another occasion, aided by only one soldier, he captured a British guard of 10 men, setting free the patriot-prisoners whom they were taking to Savannah. This act of bravery was rewarded by a handsome sword, presented by Governor Rutledge; but he refused to be made lieutenant as he could barely read or write. Jasper was mortally wounded at Savannah Oct. 9, 1779. See *Address on Jasper* by Jones.

Jassy (*yäs'sē*) the capital of Moldavia, the northern division of Rumania, is picturesquely situated on the slope of the Kopoberg Mountains, near the borders of Bessarabia. It is an irregularly built and dirty city, with crooked streets and alternate palaces and hovels. It contains many churches, one of which dates from the 4th century, and a university. The town has an active trade in corn, spirits and wine. Population 77,759.

Java (*ja'vȧ*), "the queen of the Eastern Archipelago, is an island of the Dutch East Indies and the seat of the colonial government. It is washed on the north by the sea of Java, on the east by the Strait of Bali, on the south by the Indian Ocean and on the west by the Strait of Sunda. Its length from east to west is about 600 miles; the breadth varies from 40 to 125 miles. Its area, with Madura, also a possession of the Netherlands, is 50,554 square miles.

Surface. The island is hilly and cut in many parts by deep ravines and rushing streams. A few large bays, protected by islands, furnish a safe harbor for vessels. From end to end of the island runs the mountain chain of Gunug Kendang, which rises about 12,000 feet. There are 43 volcanoes, of which several are still active.

Climate and Drainage. With the exception of some marshy districts on the north coast, the climate is healthy and pleasant. The heat is moderated by sea-breezes, which constantly blow across the island. Along the highlands of the interior the air is not only breezy, but often cold. The rivers are generally small, but become torrents when swollen by the rains; only a few are navigable.

Resources. The chief wealth consists in luxuriant vegetation and richness of soil. Java's producing quality and fertility are limited only by the scarcity of laborers; and in consequence of this fact much of the best land remains untilled. The chief products are rice, sugar, coffee, indigo, tobacco and tea. Animals are not numerous. A few tigers are found, besides rhinoceros, deer and wild swine. There are a few birds, which are noted for their beautiful plumage, but there are hardly any which sing. Though in ancient times Java was called "the land of gold," very little of the precious metal is now found. Silver also is scarce, and there are no other metals.

Commerce and History. Java's trade is mainly with Holland, the Straits Settlements and Great Britain. It has 700 miles of railroad, and is joined by cable to Europe and Australia. There were Hindu colonies in Java in 412 A. D. Mohammedanism was brought to the island in the 15th century. European merchants gained a footing in the 16th century, and the Dutch rule began in 1610. The English held Java from 1811 to 1817. In 1825 an insurrection began which was not put down till 1830. The population is 38,000,000, the bulk of which is native. The chief towns are Batavia (population 138,551); Samarang (population 96,600); and Soerabaya (population 150,198). There are 563,000 Chinese, 29,000 Arabs and 80,910 Europeans. The natives are of the Malay race in three divisions: the Madurese, the Sudanese and the Javanese proper. Most of the natives are Mohammedans, though there are 12,000 native Christians. See Wallace's *Malay Archipelago* and Sir Thomas Raffle's *History of Java.*

Jay, any one of a group of birds belonging to one division of the crow family. Jays are birds of moderate size with short, rounded wings and long, rounded tails, and are common in Europe, Asia, and North America. The blue jay of eastern North America remains throughout the year and is widely known. It is blue with black bars on the wings and tail, which are also tipped with white. Underneath it is whitish with a black collar across the chest. Its harsh cry of *jay! jay!* is varied with other notes. It imitates the sounds of several other birds, especially the hawks. It keeps quiet and retired while nesting, but is abundant in the autumn, picking up acorns and chestnuts. The jays as a group feed on seeds, acorns, eggs and young birds The Florida jay and California jay are mainly blue. The Canada jay is slaty or grayish. The common jay of Europe is crested, as are also the blue jay, the Mexican jay and others.

Jay, John, an American statesman and jurist and first chief-justice of the supreme court, was born at New York, Dec. 12, 1745. He graduated at King's College, now Columbia University, and became a lawyer. He was a member of the Continental Congress of 1774–75. As one of a committee he prepared an address to the people of British America and another to the people of Great Britain, which gave him a wide reputation. Jay took a leading part in the debates of Congress and in the secret negotiations with France before the Declaration of Independence. He left Congress to sit in the convention of New York, and drew up the constitution of that state. He was sent in 1779 as minister to Spain, one object being to secure a loan. Before he had a chance to do anything, in the face of the coldest reception by the Spanish court, congress drew on him for $500,000. Rather than let the credit of the country be damaged, he accepted the bills at his own risk. He took part with Franklin and Adams in negotiating the treaty of peace at Paris in 1783; then, going back to America, became secretary for foreign affairs till the adoption of the constitution in 1789. The famous *Federalist,* written by Hamilton, Madison, and Jay, had the greatest influence in bringing about this adoption. President Washington offered Jay a choice of the offices in his gift, and Jay preferred to become chief-justice. In 1794 he concluded a treaty with Great Britain that is known as Jay's treaty. The treaty provided for the payment of British debts and American claims arising out of the Revolutionary War, for the restriction of American trade in the West Indies and for neutrality at sea. It also contained provisions for the surrender to the United States of the northwestern military posts and for defining the eastern boundary between the United States and British America. From 1795 to 1801 he was governor of New York, and refused to be again made chief-justice. Jay was much interested in religious work. His favorite books were the Bible and Cicero. He died on May 17, 1829. See his *Life,* by William Jay, his son.

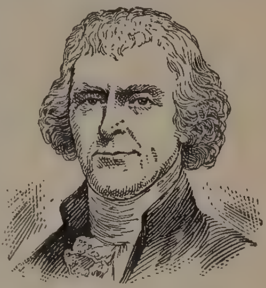
Jefferson City, capital of Missouri and the county-seat in Cole County, on the south bank of the Missouri River. It has several fine buildings and state institutions, the state and supreme court libraries and a Carnegie library, and is the seat of Lincoln Institute, a negro normal school. Coal and limestone are found in its vicinity, and it has manufactories of farm-implements, wagons, foundry and machine shops, brickyards, breweries etc. It is on the Missouri Pacific and Chicago and Alton railroads. Jefferson City has electric and gas lights, street railways and waterworks. Population 12,000.

JOSEPH JEFFERSON

Jefferson, Joseph, a noted American actor, was born at Philadelphia, Feb. 20, 1829. He came of theatrical stock, his father and grandfather being well-known American actors, while his great-grandfather had been a member of Garrick's company. When Jefferson was only three years old, he appeared in the play *Pizarro* as Cora's child, and at four years he was dancing as a miniature "Jim Crow." For many years he went through the severe training of a strolling actor, and then played at New York, where in 1857 he made a success in several characters. In 1865 he visited London, and at the Adelphi theater played his world-famous part of Rip Van Winkle for the first time. With this character his name will be forever associated. Nor is this wonderful, for it is one of the most perfect works of art — beautiful in conception and delightful and delicate in execution. The art was all the actor's; the dramatist had done nothing. Rip was a lazy, good-for-nothing vagabond; but Jefferson made him "the Arcadian vagabond of the world of dreams." In his profession he gained both fame and fortune, and his personal character was high. His death occurred on April 23, 1905. See his *Autobiography*.

Jefferson, Thomas. The author of the Declaration of Independence was the most conspicuous and consistent apostle of democracy in America. When he asserted in that immortal document that "all men are created free and equal," it to him was no high-sounding phrase of political philosophy, but a literal expression of the principle upon which he ordered his own life and his relations with men. "Jeffersonian simplicity" has for more than a century been the main timber supporting the platform of the party he founded. His forty years of distinguished public service were marked by such an entire absence of ostentation as to be felt as a rebuke by many of his associates. But his sincerity in this attitude was never questioned.

Yet Jefferson was the last man in whom such characteristics might have been expected. In birth, fortune, intellect and physique he essentially was an aristocrat. Born in Albemarle County, Virginia, April 2, 1743, the son of a well-to-do planter, his family and associations were of the leisure class, identical with the country gentry of England. His father's land was tilled by slaves. Until he was twenty his time was employed in acquiring a gentleman's education in England and in William and Mary College; and in riding, hunting and social pleasures. His superior mind easily gave him rank as a scholar in the languages, mathematics and natural sciences. In person he was over six feet in height, slenderly built but very erect. His features were delicately fashioned, his eyes a bright hazel-brown, his hair a sandy red and waving, his complexion clear and bright. He had an air of distinction but a manner of extreme simplicity that gave him popularity among all classes. He seemed designed by nature for public service. Inheriting his father's plantation, with an assured income sufficient for a gentleman's needs, his practice of the law was unusual for a man of his class. His talents secured him a place in the office of George Wythe of Williamsburg, then at the head of the Virginian bar. Jefferson's success was immediate. In the fourth year of his practice he appeared in nearly 500 cases. In 1774 he had added to his estate until he owned 5,000 acres of tobacco-land. In 1772 he added to his fortune by his marriage to Mrs. Martha Skelton for whom he built the splendid mansion of Monticello, which for half a century was the most distinguished center of private hospitality in America. Much of his land remained uncultivated, however, for he was opposed to the institution of slavery. He would buy no new slaves, and tried to have a law passed by which he could free those he had.


THOMAS JEFFERSON

From the time Jefferson was 25 years old until the opening of the Revolution he was a member of the House of Burgesses, and thus was officially connected with all the events which led up to the war. His writing of the pamphlet, *A Summary View of the Rights of America*, placed him among the leaders of the Revolutionary party. In the first continental congress he was appointed on a committee with Adams, Franklin, Sherman and Livingston to draft the Declaration of Independence. The document, as written by Jefferson, was a transcript of his famous pamphlet issued two years before. It was destined to dismember an empire, found a new nation on new principles of liberty and equality, and furnish a model for numerous nations that were to assert their right to self-government.

The years of the Revolution he devoted mainly to governing Virginia, declining more conspicuous office, and to working out a practicable form of republican government. Most of his ideas found place in the Constitution. After the war he returned to Congress. He secured the adoption of our system of coinage and the prohibition of slavery north of the Ohio River. He succeeded Franklin as Minister to France, returning in 1789 to become secretary of state in Washington's first cabinet. Here the beginnings were made in the formation of two great political parties — the Democratic (first called Republican) with Jefferson as the leader, the Whig (originally the Federalist) with Alexander Hamilton. The former stood for states rights, the latter for a strong centralized Federal government — issues that dominated the country until they were fought out in the Civil War. Jefferson's ideas prevailed in the election of 1800 when he was chosen president. "Jeffersonian simplicity" came in on inauguration-day when the new executive rode to the capital on horseback, unattended, dressed in plain cloth, and tied his horse to a fence-post. Court etiquette was abolished and titles of honor dispensed with. "His excellency" was plain Mr. Jefferson.

Jefferson's administrations (1801-9) were marked by constructive work. He stopped the preying of Algerian pirates on commerce; negotiated the purchase of Louisiana and followed it with the Lewis and Clarke expedition to the Pacific; maintained, without war, the rights of neutrals on the high seas; prosecuted his own vice-president, Aaron Burr, for suspected treasonable projects in the southwest. He reduced the public debt, fortified our seaports, diminished public taxes, and refused a third term. On March 4, 1809, he retired to private life, after forty years of continuous public service. Madison and Monroe, who succeeded him for sixteen years, were his political pupils and personal friends and, before he died, July 4, 1826, he was assured of the coming leadership of a forceful disciple from the west — Andrew Jackson.

To the last day of his life he was the most distinguished man in America — "the sage of Monticello." His hospitality was so large and free that his estate was literally eaten up, and he died poor. He passed away on the fiftieth anniversary of the signing of the Declaration, and was buried in the heart of a forest on the estate. A plain granite shaft which marks the spot is inscribed: "Thomas Jefferson, author of the Declaration of Independence." See *Memoir* by T. J. Randolph, Jefferson's son-in-law, and James Parton's *Life*.

Jeff'ersonville, Ind., a city on the Ohio River opposite Louisville, Ky., with which it is connected by two iron railroad bridges each nearly a mile in length. The falls of the river are utilized in the various manufactories, which include railroad workshops, large carworks, foundries, machine shops, flourmills, etc. There also are boat-yards, and hydraulic cement is manufactured in the vicinity. One of the state prisons is here, as are the Indiana State Reformatory and also the U. S. quartermaster's supply depot. Population 10,412.

Jef'freys, George, Lord, an English lawyer, who rose to a high position on the bench but disgraced the profession and made his name forever infamous by his cruelties and brutal disposition, was born at Acton, England, in 1648. He was the son of a squire of small means, who contrived to give his son a good education. Among his earliest trials were those of Titus Oates and Richard Baxter, and in both he displayed his brutal and vindictive nature. In 1685 he was sent to the west to try those who took part in Monmouth's unsuccessful rebellion. Three hundred and twenty were hanged as rebels during the trial, which was called the Bloody Assize; 840 were transported; and a still larger number were whipped, imprisoned and treated with the most brutal cruelty. He was appointed lord-chancellor by James II, and made a peer with the title of Baron Jeffreys of Wem. When James II was driven from the throne and kingdom, he tried to follow his master, disguised as a sailor, but was caught and shut up in the Tower of London, to save him from being torn to pieces by the mob. Here, worn out by hard drinking, he died on April 18, 1689. See *Life* by Woolrych.

Jehu (*jē'hū*), the eleventh king of Israel, reigned between 883 and 855 B. C. He was reckless and violent in character. The house of Ahab fell by his hand, and the heathen priests were executed, thus sweeping the kingdom clean of idolatry and establishing Jehovah's worship. But his reign was unprosperous. See *Second Kings*: *9* and *10*.

Jel'lyfish, the name given to free swimming hydrozoa (*q. v.*). They are common at the seacoast and are often seen from the decks of vessels, Some forms look like mushrooms, others have more the form of an umbrella or saucer with something suspended underneath. They formerly were called medusæ and acalephæ. The body is composed of a clear jelly-like substance, often highly colored in parts during the breeding-season. When taken from the water, they soon dry and shrivel in shreds. The bell-shaped swimming discs vary in curvature from that of a thimble to that of a saucer. The animal swims by the contraction of the swimming bell — the water contained inside being thrown out through a circular opening in the membrane. Tentacles and long contractile lines hang suspended from the disc. Jellyfish are provided with numerous thread-cells or nettle-cells, from which thread-like darts can be discharged, and some larger forms can inflict very severe stings by means of these darts. See Romanes' *Jellyfish, Starfish and Sea Urchins.*

Jena (*yā'nȧ*), **Battle of.** This name is applied to two engagements fought on the same day, Oct. 14, 1806 — one at Auerstadt, 14 miles north, between 30,000 French under Davoust and 48,000 Prussians under the duke of Brunswick; the other on the heights around Jena between 70,000 Prussians under the prince of Hohenlohe and 90,000 French under Napoleon. In both the Prussians were badly defeated, leaving the fatherland at the mercy of Napoleon.

Jena (*yā'nȧ*) **University** was founded about 1547 at Jena, in the grandduchy of Saxe-Weimar, by John Frederic of Saxony. It soon acquired a high reputation as a seat of learning. It is the university of the smaller Saxon states, and is supported by taxes from all. The library is large, numbering 200,000 volumes. The university has graduated many men who have become famous professors in other institutions of learning. In its schools of law, medicine and theology there have been many distinguished names. There are 112 professors and 1,362 students.

Jen'ner, Edward, the discoverer of vaccination, was born at Berkeley, England, May 17, 1749. He went to London in his 21st year and studied under the celebrated John Hunter. The discovery which has made Jenner famous was the result of a long series of experiments. His attention was attracted to the nature of cowpox by a young woman who had remarked: "I cannot take the smallpox, for I have had the cowpox." Many investigations delayed the discovery for 16 years, when, at length, the final experiment was made on May 14, 1796, on James Phipps, who was vaccinated with perfect success. The practice met with great opposition at first; but finally honors were showered upon Jenner, and he was elected a member of all the learned societies of Europe. He died of apoplexy at Berkeley on Jan. 26, 1823. See his *Life and Correspondence* by Dr. J. Baron.

Jephthah (*jef'thȧ*), one of the "judges" (B. C. 1336-1037) of the Israelites. He led in the war against the Ammonites, defeated them with great slaughter, and was chosen ruler in reward. He vowed that whoever came to him out of his house should be sacrificed to Jehovah. His own daughter met him and "he did with her according to his vow." The story is much like that of Iphigenia in Greek mythology, and both are grouped together by Tennyson in his poem *The Dream of Fair Women.* See *Judges 11* and *12.*

Jeremi'ah the prophet, son of Hilkiah the priest, was a native of Anathoth, in the territory of Benjamin. While still young he received a call to be a prophet (B. C. 627-6), and lived as a prophet, mainly in Jerusalem, for at least 40 years. Jeremiah had been a prophet five years when the lost book of the law was found and an important reformation began under Josiah. The prophet was in sympathy with this reformation, and most of his prophetic teaching had reference to it. Jehoiakim had not been long on the throne before Jeremiah began to foretell the doom of Judah. He was the first of the writing prophets and the first to declare that religion is an individual and personal relation between the soul and God. Jeremiah is believed to have met a martyr's death about B. C. 585 at Tahpanes the border-city of Egypt, but rabbinical tradition says that he escaped when Nebuchadrezzar conquered Egypt. See Cheyne's *Jeremiah* and the Bible-book of the same name.

Jer'icho, once one of the most flourishing cities of Palestine, was situated northeast from Jerusalem a journey of six hours. Westward from Jericho lies a waste tract of limestone mountains; but the town stands on a well-watered and fruitful plain, yielding dates, raisins, balsam and honey. The capture of Jericho by the Israelities on their first entrance into Canaan, is recorded in *Joshua 6.* Herod the Great resided at Jericho, and erected many beautiful buildings. It was destroyed in the reign of Vespasian, and rebuilt under Hadrian. In the time of the crusades it was captured, and at last completely destroyed. At the present time its place is occupied by a miserable village, called Riha or Ariha, with barely 200 inhabitants.

Jero'me, William Travers, was born in New York City in 1863, of wealthy parents, and was educated at Amherst College and Columbia Law School, from which he graduated in 1884. He was appointed assistant district-attorney, under Tammany rule, but turned against that organization, assisted in the famous Lexow investigation, which revealed the corrupt condition of the New York police, and was appointed justice of the court of special sessions New York City. He was elected district attorney in 1901, and showed courage and determination in the prosecution of gamblers and of other criminals. In 1905 he was again elected district attorney, running independently, after both parties had refused to nominate him. Charged with failure to prosecute certain accused corporation-managers, he was vindicated by official investigation.

Jerome (*jĕ-rōm′* or *jĕr′ōm*), **Saint,** was born at Stridon, on the borders of Dalmatia and Pannonia, sometime between 341 and 345 A. D. His parents were Christians. His early education was under the care of his father, and he afterward studied at Rome. In 386 he retired to Bethlehem, and was followed by many persons who wished to be taught by one so learned and pious as he had become during years of service in the church. Here were founded four convents, one for monks and three for nuns. Jerome himself presided over the former. It was in this sacred retreat that he completed the writings which have made him so famous. His revision of the Latin New Testament and translation of the Old Testament were wonderful achievments, and originated churchly Latin. He died at Bethlehem on Sept. 30, 420. His works consist mainly of Scripture commentaries and theological treatiases. He was the supreme scholar of the ancient church. See *Jerome* by E. L. Cutts, in The Fathers for English Readers.

Jer′sey City, the second largest city in New Jersey and county-seat of Hudson County, is on the west bank of the Hudson opposite New York, of which, though in another state, it is an extension, and with which and with Brooklyn it is connected by steam-ferries. Its site forms the broadest part of a peninsula bounded by Hackensack River and Newark Bay, and on the southeast it extends along New York Bay. Jersey City is a busy city. It is the terminus of six great, and as many local, railroads, and is connected with Easton, Pa., by canal; and at its wharves many ocean-steamers receive and discharge their freight. It is the mart of a large trade, especially in iron, coal and agricultural produce. Its own manufactures are on a large scale, and include sugar, flour, iron and steel, zinc, boilers, machinery, locomotives, oils, chemicals, oakum, lumber, silk, watches, jewelry, lead-pencils, tobacco, pottery, soap and beer. The city has large slaughter-houses, stock-yards and grain elevators, notable for size and efficiency. Here is St. Peter's (Roman Catholic) College, founded in 1878. The city spends on education annually about three quarters of a million dollars; the value of its public property for school purposes is $3,000,000. It also possesses a number of fine churches. The site was formerly called Paulus Hoek, but received its present name and became a city in 1838. Population 267,779, a gain of over 61,000 in the decade. In 1850 it had fewer than 7,000 inhabitants. This remarkable growth was brought about in 1871 and 1873 by consolidation with the neighboring municipalities of Hudson City, Greenville and Bergen. This was laid out by Peter Stuyvesant in 1660, and consequently Jersey City contains the oldest school-site in the state. School 11 is the fifth building on the original site.

Jeru′salem, the "Holy City" of the Jews, stands 2,364 to 2,582 feet above the sea, on the spurs of two hills, surrounded and divided by two valleys, once deep, now partly or wholly filled with rubbish. Both hills were strong natural fortresses. The weakness of the place for defense lay in its poor supply of water. The city was known under its name Jerusalem at least 500 years before David captured it (*c.* 1045 B. C.). The conquest of the city by the Israelites proved incomplete; before the time of the Judges it again was the "City of the Stranger." When at last won by David, the Lower City was joined to the fortress of the Upper Hill, and the whole surrounded by a wall.

The history of Jerusalem covers 3,500 years. Of these, 500 years lie back of reliable history. Of the other 3,000 years, less than 500 show us Jerusalem independent. For 600 years longer the city was in the hands of the Israelites, but never wholly independent. Jerusalem, the "city of peace," sustained 17 sieges. Twice it was entirely destroyed, its buildings being torn to the ground. There is no city in the world whose soil has so often been drenched with the blood of its people. From B. C. 536 to A. D. 70 Jerusalem was torn to pieces by factions, and came into possession of Persians, Macedonians, Syrians, Egyptians and Romans. The city was besieged, taken and razed to the ground by Titus in 70 A. D.

Its after history may be divided into four periods. The first comprises early centuries when the land was covered with Christian monasteries, churches and hermitages. The Persians in 614 captured the city and destroyed the churches. Then the Moslems appeared in 637 and the gates were thrown open without a blow. The second period includes the rule of the Moslems (637–1099). The third period is that of the crusaders (1099–1244). After 87 years of continuous war Jerusalem was lost. and the crusaders never retook it. The last period is that of Turkish or Moslem rule (since 1244). The seven hundred years covered by this period have for the greater part been years of peace.

The main buildings and monuments for which the explorer has to look are the first, second and third walls of the great temple; the royal towers; the Tyropœon Bridge; Baris or Antonia; Ophel; the tombs of the kings, and certain pools. It would be strange, if much would be left of the city of Herod, to say nothing of the city of Solomon. There is, however, more than might have been expected — more in proportion than is left of old Rome — far more than is left of Tyre, Carthage or Corinth. Excavations have been made by the English, Russians, French and Germans. The old tombs of the kings, part of David's first wall, the area which was the site of the temple and the Pool of Bethesda are certainly known, and the sites of many other features of the old city are probably known. However, scholars are not agreed as to the site of the Holy Sepulchre, which has long been a vexed question.

The present city, the chief town of a Turkish province, has a population of over 80,000, of whom half are Jews, a quarter Moslems and the rest Christians. Of late years it has grown outside its walls, the windowless, one-storied houses stretching on every side. There are banks, hotels and a railroad to Joppa. See Warren and Conder's *Jerusalem* and Besant and Palmer's *Jerusalem, the City of Herod and Saladin.*

Jet, a mineral of a perfectly black color, capable of being easily cut and carved and taking a very beautiful polish. It was first found in Asia Minor. In Great Britain it is obtained chiefly at Whitby in Yorkshire. Very large quantities are found in France, where it gives employment to many of the people of Aude. It is made into rosary beads, crosses and other ornaments. As a material for mourning jewelry it is especially valuable, and for that purpose is largely used. Imitations of jet are made from hardened india-rubber, called vulcanite or ebonite, and from glass.

Jette, Sir Louis A., was born at L'Assomption, Quebec, in 1836, and was called to the bar in 1857. He for some time was a journalist; was elected to the House of Commons for Montreal East in 1872; and was appointed judge of the Superior Court in 1878. He became professor of civil law at Laval and subsequently dean of the faculty. In 1903 he was appointed one of the Alaskan boundary commissioners. In 1898 he was appointed lieutenant-governor of Quebec.

SIR LOUIS A. JETTE

Jet'ty, an embankment or pier extending into the water, built of earth, stone and wood. Jetties are built in rivers and harbors to increase the depth of the water by narrowing the channel and thus increasing the scouring action of the current. Jetties are particularly valuable where a river empties into a sea which is more or less tideless, as the Danube into the Black Sea and the Mississippi into the Gulf of Mexico. In these cases the river is continually bringing down sediment, and this is deposited at the mouth, forming a delta. There is little or no scouring action due to the flow and ebb of the tide. The jetties at the mouth of the Danube were commenced in 1858, completed in 1861, and improved in 1868. The depth of water was increased from 9½ feet to 22 feet. The Mississippi jetties put in by James B. Eads in 1875–9 are notable among modern engineering achievements. They are embankments made by sinking mattresses of interwoven osiers and covering these with stones and concrete. These embankments prolonged a channel 1,000 feet in width for 2¼ miles seaward. The depth was increased from 8 feet to 30 feet by the scour of the river. As the deposit accumulates, it will be necessary to prolong the jetties seaward in order to scour away the fresh deposits. There are many smaller harbors and rivers in the United States which have been deepened and made safer by building jetties.

Jew'ett, Sarah Orne, an American author, was born at South Berwick, Me., Sept. 3, 1849, and was educated at Berwick Academy. She wrote many short stories and a number of novels, and was quite successful in the portrayal of rural and provincial life. Among her novels are *Deephaven, Old Friends and New, A Marsh Island, The King of Folly Island. The Life of Nancy* and *The Tory Lover.* She died June 24, 1909

Jew'ish Lit'erature. See LITERATURE.

Jews, the name given since the exile in Babylon to the descendants of Abraham, who, about 2000 B. C., emigrated from east of the Euphrates to Canaan or Palestine. Their first name was Hebrews. Jacob settled with his family in Goshen, Egypt. Here the Hebrews remained 430 years. At first they were well-treated, but a new dynasty reduced them to cruel slavery. Moses led them from Egypt about 1320 B. C. The wandering in the wilderness of the Sinaitic peninsula seems to have lasted 40 years, the chief event of which was the giving of the law to the people through Moses. The "land of promise" became theirs under Joshua about 1274 B. C. Yet not all the natives were driven out, or even conquered, till long afterward. The fine grazing-lands east of the Jordan were given to Reuben, Gad and the half-tribe of Manasseh; while the land west of the Jordan was parceled out to Judah, Simeon, Dan, Benjamin, Ephraim (the second half-tribe of Manasseh), Issachar, Zebulon, Naphtali and Asher. Levi received no province, but, instead, 48 cities and a tenth of the fruits of the field, and were allowed to settle wherever they chose.

After the death of Joshua (about 1254 B. C.), the bond between the tribes became loosened; each attended to its own affairs, and soon the tribes were singly conquered by the surrounding peoples. At this time arose brave men and women, known as "judges," who freed the nation. This period is called the heroic age of Hebrew history. The greatest of 15 judges named were Deborah, Gideon, Jephthah, the herculean Samson and Samuel. The first king was Saul the Benjamite (1067–55 B. C.), a warrior but not a statesman. He was succeeded by David his son-in-law (1055–15), the greatest king that ever sat on Israel's throne. His reign and that of Solomon, his famous son, were the golden age of the Jews. The kingdom stretched as far as the Euphrates and the Red Sea. Jerusalem was captured and made the capital, and then was built the great temple. Trade was carried on with Phœnicia, Arabia, Egypt, India, Ceylon and, perhaps, Sumatra and Java. But the enormous expense of Solomon's court beggared the nation, and his reign (1015–977) in many ways was a splendid failure. Jealousy against the supremacy of Judah (975 B. C.) caused a split into two nations, Judah under Rehoboam and Israel under Jeroboam. The first was made up of Judah and Benjamin, the latter of the other ten tribes. After 19 kings of different dynasties had reigned, the country was conquered by Shalmaneser, king of Assyria, and the mass of the people were carried away captive (720 B. C.) to Media. What became of them has never been more than guessed at. Their place was taken by Assyrian colonists, and these, mingling and intermarrying with such Israelites as were left, formed the mixed people called the Samaritans. Among the 20 kings of the house of David who ruled over Judah, Jehoshaphat, Uzziah, Hezekiah and Josiah were able rulers and zealous for the worship of Jehovah. Other kings were more or less unfaithful to the religion of their fathers. Unable to withstand the Egyptians, Assyrians and Babylonians, to each they in turn became tributary. At last, in 588 B. C., Nebuchadrezzar stormed Jerusalem and carried the richest of the people to Babylon. The exile lasted 70 years, if reckoned from 606, but only 50 years from the destruction of the city in 588, the exile ending when Cyrus the Medo-Persian captured Babylon in 538. Ezra the priest headed a second migration (*c.* B. C. 458) to Palestine in the reign of Artaxerxes I, and 13 years later came Nehemiah, under whom the walls of Jerusalem were rebuilt.

The people of Jerusalem submitted to Alexander the Great in 332 B. C. Ptolemy Soter, king of Egypt, took Jerusalem in 301 B. C., and carried off 100,000 of the people, whom he settled mainly at Alexandria and at Cyrene. They soon spread over the whole country from Libya to Ethiopia. They had equal rights with the Egyptians, and became noted for their learning, making the famous Greek translation of the Old Testament known as the Septuagint. Egypt ruled Palestine for one hundred years; then it fell into the hands of Syria, one of whose rulers, Antiochus, "the madman," outraged the feelings of the Jews by making the temple a temple of Jupiter and forcing the people daily to sacrifice swine. The heroic family of Mattathias, the priest, rose in rebellion, and under his successors, the Maccabees, the Syrians were driven out, and the national council, the Sanhedrin, set up (145 B. C.). This Maccabean war of independence is Israel's second heroic age. But a dispute over the throne between Hyrcanus II and Aristobulus brought in the Romans, and Jerusalem was captured by Pompey in 63 B. C. With Hyrcanus II ended the Hasmonean dynasty of the Maccabees. Through Cæsar, Antipater the Idumean was made procurator of Judæa. Antipater was poisoned, but his brother, Herod, became procurator over Galilee and Judæa, entering Jerusalem in triumph in 37 B. C. After Herod's death in 4 B. C. (the probable birth-year of Jesus) Judæa and Samaria were ruled for a time by his son, Archelaus, but he became hateful to the people, and was banished by Augustus emperor of Rome. Judæa was now made one province with Syria, and ruled by Roman governors. In 38 A. D. the emperor, Caligula, ordered that he should be worshiped by all his subjects. Everywhere the Jews refused to obey, and at Alexandria there was a frightful massacre. Herod's grandson, Herod Agrippa, was given power over Palestine by Claudius, and obtained for the Jews the rights of Roman citizens in 41 A. D. Roman governors succeeded him, under whom robbers and assassins overran the country; Jews and Samaritans waylaid and killed each other; and hatred of the Roman soldiery grew fiercer among the people. Finally the party of zealots, also called the assassins, rose in a rebellion in 66 A. D., which was ended, after a horrible massacre, by the conquest of Jerusalem by Titus (A. D. 70), the destruction of the temple and the killing or banishment of hundreds of thousands of the Jews, who were scattered throughout the world.

Since this dispersion of the nation its history has been a succession of cruel persecutions and massacres, with, at intervals, brief periods of good treatment, when some king or prince needed their services. Between the destruction of Jerusalem and modern times the Jews rose highest, and are seen at their best, under the Moors in Spain. In England the Jews did not gain most of their rights till the 19th century. They were not admitted to parliament till 1858, and no Jews sat in the house of lords till 1885. Jews were made French citizens by Napoleon in 1806. In Denmark the same right was given them in 1814. Norway forbade them to touch her soil till 1860. In Russia they have been forced to crowd into one district, known as the Pale, and have even been ordered out of that and out of the country (1892), a persecution which, coupled with famine and cholera, is not surpassed in horror by any in the dark ages. The Jews were given their full rights in Russia in 1848, though the feeling against them has never died out. They, of course, enjoy the fullest liberty in the United States. The Jews are distributed as follows: Russia, 3,400,000: Austro-Hungary, 1,700,000: United States, 1,777,185: Turkey, 60,000: Germany, 590,000; Rumania, 400,000; Morocco, 150,000; Great Britain, 100,000; Abyssinia, 120 000; Netherlands, 83,000; France, 49,000; Tripoli, 60,000; Tunis, 45,000; Algiers, 57,132; Italy, 38,000; Persia, 35,000; Egypt, 25,200; Bulgaria, 33,717; Turkestan and Afghanistan, 14,000; Switzerland, 8,069; the Transvaal, 10,000; Argentina, 6,735; Servia, 4,652; Denmark, 4,080; Belgium, 3,000; Greece, 5,000; Spain, 5,000; Sweden and Norway, 2,000; with scattered numbers in other parts of the world, making a total of 11,585,202.

Joachim (*yō'ȧ-kĕm*), **Joseph,** a celebrated Hungarian violinist and composer. He was born at Kitsee, Hungary, June 28, 1831. He played the violin at the age of five years, and was later taught by Szervacsinsky at Budapest. Later he was the pupil of Boehm, and still later he went to the Conservatorium at Leipsic under the direction of Mendelssohn. Here he studied under David until 1849, when he became leader of the orchestra at Weimar. In 1854 he was appointed conductor of concerts and solo violinist to the king of Hannover. In 1868 he was given charge of the musical school in the Academy of Arts at Berlin. Joachim was recognized as a master of technique. Of his compositions the most notable was his Hungarian Concert, op. II.

Joan of Arc (*jōn* or *jō-an* of *ärk*) or in the French form *Jeanne d'Arc* (*zhän d'ärk*), the Maid of Orleans, the daughter of humble parents, was born at Domremy, France, Jan. 6, 1412. She was taught, like other young women of her station, to sew and spin, but not to read and write. She was more modest and pious than her companions, and, when about 13, she believed that she saw a flash of light and heard a heavenly voice bidding her be diligent in her religious and holy duties. When 15, she imagined that the heavenly voice bade her go and fight for the dauphin of France. She went and persuaded him of the truth of her heavenly mission. She put on male dress and warlike equipments, and, with sword and banner, put herself at the head of the French troops, whom her example and the knowledge of her heavenly mission inspired with new confidence. From April 29 to May 8, 1429, the army under her leadership gained many victories over the English at Orleans. The national courage was kindled by these successes, and Joan became the heroine of France and the dread of the English forces who had been routed by her. She conducted the young prince to Rheims, where he was crowned on July 17, 1429, and Joan, whose bravery made this possible, saluted her king with tears of joy. She wished now to return home, thinking her mission ended, but Charles persuaded her to remain with the army, and she at last consented. In a battle with the Burgundian forces in Compiègne the French troops were defeated, and Joan was taken prisoner and sold to the English for a sum equivalent to $3,200. At Rouen, the headquarters of the English, she was tried before the bishop of Beauvais as a sorceress and witch, and after a long, shameful and unjust trial she was condemned to be burned at the stake. She suffered this terrible fate on May 30, 1431. "We are lost," said an English soldier; "we have burned a saint!" In 1456 her trial was declared unjust, and Joan, a heroine and martyr, has since had an honored and unique place in history. See *Lives* by Michelet, Parr, Tuckey and S. L. Clemens.

Job, the hero of the book named after him. He is said to have lived in Uz, somewhere between Palestine and the Euphrates. The belief of most scholars at present is, that the book is a dramatic poem and that Job is not a real person, but simply the main character in this poem, as Hamlet is in one of Shakespeare's plays. No one is now able to determine the authorship of the book. As a work of genius and art it has the first rank in Hebrew literature, and abounds in sublime thought. It shows a man, who through suffering and trial, remains true to his trust in the wisdom of Providence. The book was, perhaps, written during the exile. It is ranked with *Hamlet* and *Faust* as the three greatest poems of their class. See Davidson's *Job* and Froude's *Short Studies on Great Subjects*.

Johan'nesburg, a town in Transvaal, South Africa, and the chief point in the Witwatersrand gold-fields. It is 35 miles south of Pretoria, the capital. The town has had a remarkable growth. Railroads connect it with Delagoa Bay, Durban, Port Elizabeth and Cape Town. The population recently numbered 237,220, consisting of (120,411) whites, (116,809) colored, aboriginal natives and other colored races. The town is well-equipped with churches, banks and mercantile houses, but the water supply is poor and sanitary arrangements are defective. Dust-storms are a feature, and fevers sometimes are epidemic. With the outbreak of the Boer War Johannesburg temporarily lost its British population, which hurriedly withdrew. The city was occupied by Lord Roberts on May 31, 1900.

John, Eugènie. See MARLITT, E.

John of Austria was the illegitimate son of Emperor Charles V and Barbara Blomberg, and was born at Regensburg, Germany, on Feb. 24, 1547. He was brought to Spain while a boy, and after the death of his father he was taken in charge by his half-brother, Philip II. In 1570 he was given the command of an army sent against the rebellious Moors in Granada. On Oct. 7, 1571, he gained a great victory over the Turks in the famous naval battle of Lepanto. He was made viceroy of the Netherlands by his brother in 1576. By the great battle of Gemblours, in 1577, won against William the Silent, he gained new honors. Philip, fearing that he might make himself king, became jealous of his growing fame and influence. John soon after died in camp, perhaps of poison, on Oct. 1, 1578 See *Don John of Austria* by Sir W. Stirling-Maxwell.

John surnamed Lackland, king of England (1199-1216), was the youngest of the five sons of Henry II, and was born at Oxford on Dec. 24, 1167. John joined his brothers in their rebellion against his father, and knowledge of this ungrateful act hastened Henry's death (1189). Richard I succeeded but died in 1199, choosing John as his successor. Arthur, the son of Geoffrey, was the rightful heir to the crown; but he was seized, imprisoned at Rouen, and soon put secretly to death. John proved an active king. He compelled William of Scotland to do him homage, put down a rebellion in Ireland, and subdued the independent prince of Wales. Not satisfied with these activities, he quarreled with the pope and confiscated the property of the church and clergy. The pope in return placed John's kingdom under an interdict, and in 1212 deposed the king and gave his subjects permission to revolt. John was compelled to submit to Rome and hold his kingdom as a dependent of the pope The English barons were anxious to end the tyranny of John, and drew up a petition, which the king rejected. This was the signal for war. The army assembled at Stamford, and marched to London, led by the rebel barons. They met the king at Runnymede, and on June 15, 1215, he was forced to sign the Great Charter (*Magna Charta*), the basis of the English constitution. The pope soon refused to sanction the new charter, and war again broke out. The barons called upon the dauphin of France to be their leader, and Louis landed at Sandwich on May 21, 1216. In attempting to cross the Wash, John lost his regalia and treasures; was taken sick; and died at Newark Castle on Oct. 19, 1216, in the 49th year of his age. See the histories by Pearson, Green and Stubbs; *The Early Plantagenets* in the Epochs of Modern History Series; and Norgate's *England under the Angevin Kings.*

John of Gaunt (Ghent), was the fourth son of Edward III, who made him duke of Lancaster. He was born in March, 1340, at Ghent. In the French wars he served with great bravery under Edward the Black Prince. In 1370 he married Constance, daughter of Peter the Cruel, king of Castile. On Peter's death John claimed the kingdom in the name of his wife, but the military expedition to obtain Castile proved unsuccessful. Toward the end of his father's reign he became the chief man in the kingdom, and perhaps wished to succeed him; at any rate, the young king, Richard II, distrusted him and sent him on another wild expedition after his Castilian kingdom. This resulted in a treaty between John and Henry of Trastamara, who had possession of the throne, by which John's daughter should succeed as queen of Castile. On the death of his second wife he married Catharine Swynford by whom he had three sons and a daughter. From the oldest child was descended Henry VII. John died at London on Feb. 3, 1399.

John II of Poland was the younger son of Sigismund III. Having embarked for Spain, to persuade Philip III to form a league against France, he was shipwrecked and imprisoned for two years at Vincennes. Being released on a promise by his brother, the king of Portugal, never to war against the king of France, he went to western Europe, became a Jesuit priest, and was made a cardinal by Innocent X. Returning to Poland, he became king after his step-brother Ladislaus in 1648. During his reign Poland was attacked by Russia and Sweden, the war ending victoriously for Poland and several provinces being added to her territory. John surrendered the crown in 1668, and retired to France, where he died on Dec. 16, 1672.

John III (So'bieski) of Poland and one of the greatest warriors of the 17th century, was born in 1624. and received the most careful education and training. When the Poles were defeated by the Russians in the battle of Pilawiecz, the Sobieskis took up arms to restore their country. Mark fell on the banks of the Bog; John so distinguished himself by his valor that he became the hero of his countrymen. He defeated the Turks in the great battle of Kotzim, in which they lost 28,000 men. On May 21, 1674, Sobieski was elected king of Poland, and was crowned at Cracow with his wife. When the Turks besieged Vienna in 1683, John hastened thither with 20,000 Poles, and, with the German allies, gained a great victory on Sept. 12. He died of apoplexy on June 17, 1696. Sobieski was not a statesman and warrior only but a lover of science and a man of gentle disposition and pleasant manner.

John I, João the Great, king of Portugal, was the son of Peter I, and was born at Lisbon in 1357. At the death of his brother in 1385 he became regent, and seized the throne from the rightful heir. A war followed with Spain, in which John was victor. In 1415 he took Ceuta from the Moors. His reign was one of prosperity to Portugal. He died in 1433.

John II, João the Perfect, king of Portugal, was born at Lisbon in 1455. At 26 he succeeded his father, Alphonso V, and was crowened on Aug. 29, 1481. His reign is historically important, because of the voyages of discovery sent out by him under Diaz, who discovered the Cape of Good Hope, and Da Gama, who visited India. Other navigators explored the African coasts. He died in 1495.

John, Saint, the apostle and evangelist, was the son of Zebedee, a fisherman of Galilee. He was born at Bethsaida, and, until called by Jesus to be a disciple, followed his father's occupation. The events of his life from this time to the ascension of Christ are to be learned from the *Gospels*. Besides *Revelation* he is held to be the author of the *Gospel* and the three *Epistles* which bear his name.

Johns Hop'kins University at Baltimore, Md., was founded by Johns Hopkins (*q. v.*), a wealthy citizen of the Maryland town. In viewing the institution, Johns Hopkins Hospital, with its world-famed medical school, must be included, for the separate organizations founded by Johns Hopkins are under the same general management. For founding the hospital and university, Johns Hopkins gave the sum of $7,000,000. The university was incorporated in 1867 and opened in 1876; the hospital was opened in 1889; and students were received at the medical school in 1893. Johns Hopkins University is preëminently a graduate-school, providing facilities for advanced work in philosophical and scientific studies. For its advanced work it ranks with the leading universities of Europe. There, however, is maintained an adequate undergraduate department. The professors and instructors number 200 and the students 800. In 1902 the university was presented with a magnificent park lying on the outskirts of the city which is to become the future home of all the departments but that of medicine, which is established in connection with the extensive hospital-buildings on Broadway.

John'son, Andrew, the seventeenth president, was born at Raleigh, N. C., Dec. 29, 1808. When Andrew was four, his father was drowned. He left his family no property, so that Andrew very early was apprenticed to a tailor, whom he served for seven years, without any previous schooling. In 1825, with his mother, he emigrated to Tennessee, where he settled at Greenville. Here he worked at his trade about a year and then married. His wife was better educated than Johnson, and became his teacher in writing and arithmetic. At this time he could read, but his knowledge went no farther. Johnson naturally was a political leader. In 1830, when the town became a city, he was elected mayor, an office he held for three years. In 1835 he was chosen member of the legislature, and in 1841 member of the senate. In 1843 he was elected to congress, where for ten years he worked for the Democratic party. He was twice chosen governor of Tennessee, and in 1857 was made United States senator. Here he opposed all disunion schemes, and during the Civil War was the leader of the southern union men. In 1862 he was appointed war governor of Tennessee. In this position he gave such satisfaction that the Republican party nominated him for vice-president, and he was elected with Lincoln in 1864. On April 14, 1865, by the assassination of President Lincoln, Johnson became president. His administration is memorable because of the contest between him and Congress, though both were elected by the Republican party. Johnson's policy toward the south was held to be too lenient by Congress, which passed what are known as the reconstruction measures over his veto. There was a great deal of ill-feeling; the president was accused of being disloyal; and his removal of Secretary Stanton from the department of war brought on the crisis. Charged with violation of the tenure-of-office act, the president was impeached, but was acquitted. Mr. Johnson was chosen a United States senator in 1875, but died in Tennessee on July 31. See his *Life* by Savage.

ANDREW JOHNSON

Johnson, Eastman, was born at Lowell, Me., July 29, 1824. At an early age he developed talent as an artist, and soon earned enough to pay for a course of study in Europe. He remained abroad six years, and settled in New York in 1856. His most famous paintings are *Old Kentucky Home*, *The Boyhood of Abraham Lincoln* and *The Wounded Drummer Boy*. His work has been among the best known and most popular of any American artist. He died on April 6, 1906.

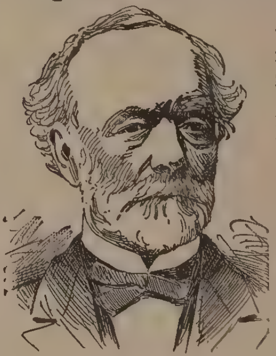
Johnson, Reverdy, was born at Annapolis, Md., May 21, 1796. He studied law, and was admitted to the bar in 1815. He gained high reputation as a profound lawyer, and frequently argued cases before the supreme court of the United States. He was elected to the senate in 1845, where he served four years. He was attorney-general in President Taylor's cabinet. He again became senator in 1862, and in 1868 was appointed minister to England. He died in Maryland in 1876.

Johnson, Richard Mentor, vice-president of the United States, was born in Kentucky in 1780. He was a state legislator; then a member of Congress from 1807 to 1837, ten years out of the thirty being a senator. In the War of 1812 he did good service on the Canadian frontier. In the battle of the Thames he was badly wounded, but is said to have killed the celebrated Tecumseh. In 1836 he was elected vice-president. He died at Frankfort, Ky., Nov. 19, 1850. He was distinguished for gentleness of manners and kindness of nature.

John'son, Dr. Samuel, was born at Lichfield, England, on Sept. 18, 1709. He received his early education in his native town and from his father's library. In 1729 he went to Pembroke College, Oxford. Here Johnson spent the unhappiest period of his life. He was oppressed by debt and other difficulties, which prevented him from taking his degree. After teaching school, which he greatly disliked and in which he was a failure, he began to translate for the press; and when his affairs were at their worst he married. In 1737, with a tragedy and twopence half-penny in his pocket, he came to London. His struggle for a living is touching. Sometimes dinnerless and bedless, always ill-fed and shabbily dressed, he never whined about his hardships, and there is no braver figure in English literature. Meanwhile he was slowly becoming the foremost writer of the day. In 1738 appeared his poem of *London*. From 1747 to 1755 he worked on his famous *Dictionary*. When the huge undertaking was nearly done, a nobleman whose help at an earlier time had been refused to Johnson wished to patronize the writer and his work. To this Johnson replied in the famous letter of Feb. 7, 1755, which perhaps is the finest piece of indignant writing on record. About this time came out his *Vanity of Human Wishes* and *The Rambler*. In 1759 was published *Rasselas*. A pension of $1,500 a year enabled him to spend his last twenty-two years in comfort. He gathered at his house a queer company of homeless friends, besides providing a night's lodging to many waifs and strays and often putting pennies into the hands of street Arabs asleep on the pavement, that they might wake up and find that they had wherewith to buy a breakfast. In 1781 appeared his *Lives of the Poets*, perhaps his most enduring work. He died at London on Dec. 13, 1784. See Boswell's *Life of Johnson*. See the *Essay* by Macaulay, that by Carlyle and Leslie Stephens' *Johnson* in the English Men of Letters Series.

Johnson, Sir William, was born at Warrentown, Ireland, in 1715. At 23 he was sent to America to manage the estates of his uncle. His business brought him into contact with the Mohawk Indians, whose language he learned, and who made him an honorary chieftain of their tribe. Johnson received his baronetcy during the French and Indian Wars. His services to the British cause were so highly esteemed that the king presented him with 100,000 acres in New York. Here was planted a settlement, named Johnstown for him, in Tyrone County; and here he died on July 11, 1774. See his *Life* by W. L. Stone.

John'ston, Albert Sidney, was born in Kentucky, Feb. 3, 1803, and was educated at West Point, where he graduated in 1826. He fought in the Black Hawk War, and later emigrated to Texas, where he was made commander of its forces. In 1838 he was appointed secretary of war in Texas. During the Mexican War Johnston was inspector-general on the staff of Gen. W. O. Butler. At the outbreak of the Civil War he was brigadier-general in the department of the Pacific, but in May, 1861, entered the Confederate service as general, with a command in the west. With 50,000 men he attacked General Grant on April 6, 1862, at Shiloh, where was fought a notable battle. General Johnston was killed by a rifle-ball on the first day of the engagement. He was one of the bravest and ablest of the Confederate generals. See the *Life* by his son.


JOSEPH E. JOHNSTON

Johnston, Joseph Eggleston, an American general, was born in Virginia, Feb. 3, 1807. His mother was a niece of Patrick Henry. He graduated at West Point in 1829, fought in the Seminole War and served with great bravery in the war with Mexico. In 1861 he entered the Confederate service, and was appointed brigadier-general, with command of the army of the Shenandoah. He came to the help of Beauregard at the first battle of Bull Run. In 1862 he was disabled for months by a wound received at Seven Pines, while opposing McClellan. In 1863 he tried to relieve Vicksburg, but failed, as his command was too weak. He commanded the force sent to oppose Sherman's march on Atlanta in 1864, and stubbornly resisted the latter's progress, but was steadily driven back, and was relieved of his command. In February, 1865, Lee placed him again in command, with orders to "drive back Sherman." But Sherman's force was four times as great, and, after hearing of Lee's surrender, he surrendered his own force on April 26. He was elected to Congress in 1877. He received the appointment of United States commissioner of railroads from President Cleveland, and retained this office until his death at Washington, D. C., on March 21, 1891. He was an able general and a man of wide culture and ability. See his *Narrative of Military Operations.*

Johnston, Richard Malcolm, an American writer, was born at Powellton, Ga., on March 8, 1822, and was educated at Mercer University. He studied law, and was admitted to the bar. Later he was called to the chair of literature at the University of Georgia, which he held until the outbreak of the Civil War. He then opened a boys' school, near Sparta, Ga., which he removed to Baltimore, Md., in 1867. It was not until after this date that he appeared as a writer of short stories and novels, which gave him wide popularity. In 1871 he published *Dukesborough Tales*, a series of southern stories and character sketches then new and charming in style and humor. Among other works are a *History of English Literature*, written in collaboration with W. H. Brown; *Life of Alex. H. Stephens; Studies, Literary and Social; Old Times in Middle Georgia;* and *Pearse Amerson's Will.* Judge Johnston died at Baltimore, Sept. 23, 1898.

Johnstown, N. Y., county-seat of Fulton County, is on the Fonda, Johnstown, Gloversville and Northville Railroad and on Cayadutta Creek, 40 miles northwest of Albany. It was founded in 1764 by Sir William Johnson, who erected Fort Johnson, a courthouse, a jail and an Episcopal church. To-day it possesses electric tramways and the other adjuncts of a modern town. Its chief industry is that of the manufacture of gloves and knitted goods, but the gelatin, lumber, gristmill and machineshop products are noteworthy. Population 10,447.

Johnstown, Penn., a city on Conemaugh River, by rail fifty-eight miles southeast of Pittsburg Manufacturing of various kinds is extensively carried on, steel-making being the most important industry. The plant of the Cambria Steel Company is one of the best equipped establishments of the kind in America. There also are the Lorain Steel Company, an iron and steel works, furniture factories, potteries, a wireworks and woolen and leather factories. Public buildings of note are Cambria Free Library, Conemaugh Valley Memorial Hospital, the city-hall, high school, Franciscan monastery and several churches.

Johnstown is famous as the scene of one of the greatest catastrophes of recent years. By the bursting of a reservoir on May 31, 1889, the city was overwhelmed with a flood. The water descended through a narrow valley and destroyed everything in its path. The loss of life is estimated at 2,500 or 3,000. An appeal for aid was generously responded to both at home and abroad, the cash contributions amounting to more than $4,000,000. Johnstown to-day is a much larger and finer city than before her misfortune, of which but few traces remain. The city occupies the hundredth place in America's large cities, its population being 55,482.

Joliet (*jō'lĭ-ĕt*), a city in Will County, Ill., 36 miles from Chicago on Desplaines River, at the terminus of the Chicago Canal. The rapids give water-power estimated to be sufficient to run machinery to employ 50,000 men. Six railroads, the Illinois and Michigan Canal and an electric line to Chicago furnish transportation. Pig iron, Bessemer steel, steelcars, steelrods, wire, nails, wirefence, tinplate, Corliss engines, steam boilers, stoves, agricultural implements, matches, horseshoes and wall paper are manufactured on an extensive scale. The oatmeal works are the second largest in the world. Stonequarrying is an important industry. The 22 school buildings are made of Joliet limestone. The township high-school building, recently completed at a cost of $225,000, is said to be the best equipped school-house in the state. Other notable buildings are the Illinois Steel Company Athenæum (a clubhouse for workingmen), two hospitals, two academies and a public library. The northern state penitentiary is located here. Population 34,670.

Joliet (*zhô-lyā̆'*), **Louis,** one of the early explorers of the Mississippi, was born at Quebec in 1645. He studied at the Jesuit College, Quebec, intending to become a priest. He, however, abandoned this intention, and spent some years as an Indian trader, thus getting a knowledge of the languages and geography of the west. With Marquette he was selected to explore the western country and push through to the Mississippi. They started in May, 1673, reaching the Mississippi at the mouth of the Wisconsin in June. They floated down the Mississippi, passing the mouths of the Missouri and the Ohio, and going far enough to be sure that the river flowed into the Gulf of Mexico. Joliet upset his canoe on his way back, losing all his maps and papers, so that the only accurate report of the expedition was Marquette's. Joliet was given the seigniory of Anticosti Island in 1680 and, later, that of Joliette. Few men have contributed more to the geography of that time than did Joliet. He died in 1700. See Parkman's *La Salle and the Discovery of the Great West.*

Joly (*zhŏ̇'lĕ̇'*), **Sir Henry G.,** was born in France in 1829. He was educated at Paris, and was called to the bar in 1855. He became premier and commissioner of public works of Quebec in 1878. In 1867 he was elected by acclamation both to the Assembly and the Commons. He sat in both Houses until 1874, and remained in the Commons until 1885. He was appointed minister of Inland Revenue in 1896, in the Laurier Ministry, and later Lieutenant-Governor of British Columbia. He is an authority in all matters of forestry.

JOHN PAUL JONES

Jones, John Paul (1747-92). In 1761 a sea-captain brought a sailing vessel with a cargo of Virginia tobacco into the harbor of Whitehaven, a sea-port on the English shore of Solway Frith. One evening, with a crowd of spectators on the stone pier, he watched a boy bring in his fishing-boat in the teeth of a gale that had strewn the coast with wreckage. The little hero of the hour was John Paul, a Scotch lad from the fishing-village of Kirkbean. Such good material for a sailor was not to be left behind, so, when the vessel made its next voyage, John Paul was on board, apprenticed for five years. On the Rappahannock River, Virginia, he saw his elder brother William, who had been adopted by a wealthy planter and distant relative and taken his name of Jones. Then he sailed away again. At 17 he brought the vessel into Whitehaven after all the officers had died, and became captain. At 25, it is said, he knew as much of seamanship as any man in his majesty's navy. Besides, he was a handsome youth of courtly bearing. He had picked up French and Spanish in foreign ports, studied history, philosophy and polite literature, and cultivated the society of shipowners, planters and bankers. Three times he visited his brother on the Rappahannock, the last time to find the brother dying and himself the heir to 3,000 acres of tobacco land.

Twenty-eight years old, rich, handsome, accomplished, he immediately put his estate into the hands of trustees and offered his services to Congress in the Revolutionary War. Before Christmas, 1775, John Paul Jones raised the pinetree-and-rattlesnake flag on the first American man-of-war. In 1778 he floated the stars and stripes from the *Ranger* and carried the news of Burgoyne's surrender to France. He sailed the western coast of England, destroyed the shipping at Whitehaven, and defeated the guardship *Drake* in the English Channel. Flushed with victory he asked Louis XVI of France for a naval vessel, He got one, and named it *Bon Homme Richard* in compliment to Franklin, then our minister to France. With this vessel he fought the famous battle with the *Serapis.* Lashing the two together, he boarded the enemy, cut loose and saw his own ship go to the bottom. He was made a chevalier of France and an admiral of the Russian navy. Congress voted him a gold medal. The reward seems trivial, but the young republic had no money, no navy, no way of honoring its seafighter or using his services. So he disposed of his Virginia estate, lived in Paris and died there in 1792. A week before he died he was offered the command of the navy of the French Republic. Gouverneur Morris, then United States minister to France had his body placed in a lead coffin filled with alcohol and placed in the vault of the church of foreign Protestants, temporarily, so it could be brought home for burial. But three months later the days of the Terror began, and Jones' casket was hurried into an unmarked grave in the old cemetery of St. Louis. The ground was afterwards built over, and our hero lay under a solid block of buildings for more than a century. In 1905 the American ambassador, Gen. Horace Porter, after a five year's search found the casket, and the body of our first naval hero was brought home in a man-of-war and buried at the naval academy, Annapolis. It has been proven, too, that he did not die in poverty and neglect, as has been charged to our country's discredit. He had a fortune of $50,000, well invested, that was inherited by Scotch relatives, and he was surrounded by devoted friends. Still young, ambitious and an ardent republican, he meant to help the French win their liberty, as they had helped us. The great Napoleon deplored the untimely end of this naval genius, and said that if Jones had lived France would have had an admiral worthy to meet Nelson at Trafalgar. See *Lives* by Abbott, Hamilton and Simms.

Jon'son, Ben, an English dramatist, was born at Westminster (now in London) about 1573. He received his education at Westminster School, where he had as his teacher the celebrated William Camden. For a time he followed the profession of actor, but soon after began to write dramas. The first that proved a success was *Every Man in His Humor*, in which Shakespeare acted one of the parts, in 1598. His *Masques* were written for the courts of James and Charles, and are elegant and graceful in style. He was one of the most learned men of his age.

and the influence of his writings proves the strength and the talent of the man. As a song-writer he had few equals. Toward the end of 1625 he was attacked by the palsy and afterward by dropsy. During the last three years of his life he was unable to leave his room. He died in August, 1637, and was buried in Westminster Abbey. The stone above his grave bears the inscription: "O rare Ben Jonson!" See A. C. Swinburne's *Study of Ben Jonson.*

Jop'lin, Mo., a city and railroad-center in Jasper County, southwestern Missouri, near Kansas and ten miles from Oklahoma. It lies 14 miles southwest of Carthage, and is intersected by five railroads. Its mining industries are considerable, for it is the center of the lead and zinc region of southwestern Missouri, which is the richest mining camp (for those ores) in the world. It has smelting furnaces, foundries, machine-shops flourmills, boilerworks, a soapfactory and whitelead works. It has banks, good schools and churches and fine public buildings. The population has grown greatly in the past decade, its present inhabitants numbering 32,073.

Jop'pa. See JAFFA.

Jor'dan, David Starr, naturalist and educator, formerly president, now chancellor of Leland Stanford University, was born at Gainesville, N. Y., Jan. 19, 1851, and graduated at Cornell University and at Indiana Medical College. From 1872 to 1879 he held chairs at various collegiate institutions, and from 1879 to 1885 was professor of zoology in and from 1885 to 1891 president of, Indiana University. He also acted as assistant to the United States fish-commission, and was United States commissioner in charge of the fur-seal investigations. In 1891 he was chosen president of the Leland Stanford University. He resigned the presidency in 1913, and was appointed chancellor. He is the author of *Invertebrate Animals of the Northern United States; Fishes of Northern and Middle America; Factors of Organic Evolution; Care and Culture of Men;* and numerous papers on ichthyology.

Jor'dan River, the chief river of Palestine, the bed of which forms a great valley stretching from north to south in the eastern part of the country. It is formed by the junction of three streams. The highest source is the Hasbany, which rises near the Druse town of Hasbeiya on the west side of Mt. Hermon. The Jordan flows south, and after a little over 100 miles, passing through the Waters of Merom and the Lake of Tiberias, 682 feet below the Mediterranean, it falls into the northern end of the Dead Sea, 1,292 feet below the ocean. Its banks are of white marl, at times steep, but there are more than 40 fords for crossing.

Jorullo (*hō-rōōl'yō*), a volcanic mountain in Mexico, 4,315 feet above the sea, 150 miles west of the City of Mexico. During one night, Sept. 29. 1759, Jorullo was thrown up from a plain by the pressure of volcanic force.

Jo'seph, son of Jacob and his father's favorite. His envious brothers sold him into Egypt where his conduct and skill in reading dreams raised him to high favor with the Pharaoh and to the first place in the kingdom. The story is told in complete detail in *Genesis*.

Josephine (*jō'zē-fēn*), **Marie Rose,** empress of the French, was born on June 23, 1763, on Martinique. She had only a poor education, but her qualities of mind and heart, even more than her beauty, won universal regard. In 1779 she was married to Viscount Beauharnais. Josephine's husband was executed during the reign of terror, she herself barely escaping. On March 9, 1796, she was married to Napoleon Bonaparte. She accompanied him on his Italian campaign, and used her influence in restraining him from measures of violence and cruelty. But as she had no children by Napoleon, her marriage was dissolved by law on Dec. 16, 1809. The empress lived near Eoreux and died at Malmaison, May 29, 1814. See the *Memoirs of Madame Rémusat.*

Jose'phus, Flavius (JOSEPH BEN MATTHIAS), a Jewish writer and historian, was born at Jerusalem in 37 A. D. of a distinguished family, and was thoroughly educated. He finally entered the sect of the Pharisees. In 63 A. D. he was sent to Rome on a political mission, and, being successful, became a man of consideration among his countrymen. During the Jewish insurrection he was in command of affairs in Galilee. When he finally fell into the hands of the Romans, he saved his life by acute flattery, predicting the rise of Vespasian to the imperial throne. The latter half of his life was passed as a resident of Rome in learned leisure. Not all of his writings have come to us, but we have a history of the Jewish wars from 170 B. C. to the destruction of Jerusalem; a history of the Jews from the creation to 66 A. D.: an autobiography; and a work against Apion. The date of his death is not known, but probably he died about 95 A. D.

Josh'ua, the son of Nun of the tribe of Ephraim, is first mentioned in *Exodus xvii: 9*, as commanding Israel at the battle of Rephidim. He was sent out as one of the 12 spies from Kadesh to get information about the strength of the Canaanites. When the others returned disheartened, he and Caleb alone retained their courage. These two, therefore, out of all the grown men of Israel, were exempted from the divine sentence that because of their want of faith they should fall in the wilderness. After the death of Moses Joshua became the leader of Israel, and the book that bears his name tells of his conquest and the settlement of Canaan.

Josi'ah, king of Judah from B. C. 638 to 609 entered upon his reign at the age of eight. He grew up an earnest, religious reformer, and purged Judah and Jerusalem from idolatry. Josiah was the last of the "good" kings. He was killed at the battle of Megiddo in the valley of Esdraelon, while trying to check the advance of Pharaoh-Necho against the Assyrians. The prophets of his reign were Jeremiah and Zephaniah.

Jötunheim (*yĕ'tŭn-hīm'*). The ancient Scandinavians believed that besides Odin and the gods there lived giants of the frost, of the mountains etc., who had their separate home and feasting hall, Jötunheim. These giants after all were the forces of nature; hence, when Thor visits Jötunheim and would contend with them, he is easily worsted; for not even a god can shatter the earth, consume like fire, race with thought or wrestle with time and age. The giants lived before the gods; but some day they and the gods together would perish to make way for a happier earth

Jötuns (*yĕ'tuns*), divinities in Scandinavian mythology, which personified various elements of evil. Their stature and strength were gigantic, but their intelligence was inferior to that of human beings.

Joubert (*you'bĕrt*), **Petrus Jacobus,** a Boer general, was born at Congo, Cape Colony, in 1833. He was state-attorney for Transvaal in 1867, and was prominent in affairs long before events gave his name to the world in later times. In his military career he first distinguished himself by the defeat of Gen. Sir George Colley at Majuba Hill in 1881. In 1896 he was prominent in causing the surrender of Dr. Jameson, following the latter's famous raid that year. In the later war with England General Joubert became known as an able tactician in the kind of warfare practiced by the Boers. He was in command of the force that besieged Ladysmith, and repulsed General Buller at Chieveley. He died of disease at Pretoria, March 27, 1900.

Joule (*jōōl*), **James Prescott,** a distinguished English physicist, born at Salford, Dec. 24, 1818, died at his country place near Manchester, Oct. 11, 1889. He was a brewer by trade, as were his father and grandfather before him; but having become interested in chemical and physical problems through the instruction of Dalton, his father provided him with a private laboratory. His most important work includes (1) an accurate study of the heating effect of an electric current (See *Joule's Laws*, "Electricity"); (2) a study of the changes in the dimensions of a body which accompany its magnetization; (3) accurate determinations of the mechanical equivalent of heat, employing various methods and showing the equivalence of energy of various forms; (4) an elaborate study of the subject of thermometry; and (5) the discovery of the exact laws according to which gases expand when they do no external work, a research of fundamental importance in establishing the absolute scale of temperatures. See Joule's *Scientific Papers.*

Jour'nalism, the art of making newspapers, is becoming very important with the rapid growth of the newspaper. The daily paper, which must be in every man's hand in the early morning hours or ready for his evening's rest, is the product of more than a hundred brains. The editor-in-chief decides the political policy; his staff is composed of a number of subeditors or editors of departments — the city editor, the foreign editor, the telegraph editor, the financial editor, the agricultural editor etc. The city editor, next to the chief editor, is the most important. He has a large staff of reporters who gather the news of the day in the city where the paper is published. The managing editor on a large paper often is not the same person as the chief editor, but is the business manager. The night editor puts the paper to press — if it is a morning paper — decides all questions as to type, surplus matter, "boiling down" or condensing communications, not hesitating to cut down the work of all the other editors. The advertisements he cannot alter or throw out, as they have been paid for, and the reading matter must take what space is left. Reporters hold the lowest position on the literary staff. They usually begin work without a salary, and are paid only for what they write. Their work is hard — often dangerous and exciting. They must keep ahead of rival journals in gathering the news, and often have many disagreeable experiences and even hair-breadth escapes in their frantic rush for the latest information. As they show their fitness they are raised to the grade of special correspondents, sent to the legislatures and congress, European cities and seats of war. Nearly all large newspapers have offices in London and Paris, and by taking advantage of the five hours' difference of time the news of the morning papers of Europe can be gathered and sent to the morning papers in the United States. The subeditors are usually taken from the reporters and special correspondents. Journalism has become a distinct profession, and there are schools of journalism and chairs of journalism in some colleges. See NEWSPAPERS.

Juan Fernandez (*hōō-ăn' fĕr-năn'dĕth*), a rocky island in the Pacific off the coast of Chile, to which it belongs. It is 13 miles long and four broad, and is covered for the most part with high, rocky peaks, the highest of which is about 3,000 feet above sea-level. There are many fertile valleys, which yield oats, apples, strawberries, peaches, figs and melons. Here Alexander Selkirk, a pirate, lived alone for four years.

His story is supposed to have suggested Defoe's *Robinson Crusoe*. The island was discovered in 1583 by a Spaniard whose name it bears. There is a small Swiss colony.

Juarez (*hōō-ä'râs*), **Benito,** a president of the Mexican republic, was born in Oaxaca of Indian parents in 1806. He became governor of his native state and an active member of the Liberal party. When Santa Anna was dictator, he was exiled, but returned to Mexico when the republic was restored. In 1858, when the Liberal president was overthrown, Juarez was president of the supreme court, which is equivalent to vice-president. He at once took the government into his own hands, but was forced to fall back to Vera Cruz, where his government was recognized by the United States in 1859. In 1861 he was able to enter the capital, and was chosen president for four years. In the same year the allied forces of England, France and Spain occupied Vera Cruz. But the French alone remained and declared war against Juarez. Maximilian's brief reign came to an end in 1867, when he was shot by order of court-martial, and Juarez once more entered Mexico and was chosen president for a second term. In 1871 he was re-elected. Risings and rebellions were almost endless, but he faced all his foes with the dogged courage of his race, and was still triumphant when he died on July 18, 1872. The present prosperity of Mexico is in large measure due to Benito Juarez.

Ju'dah was the fourth son of Jacob and founder of the greatest and most populous of the twelve tribes, to which belonged the royal house of David. For history of the tribe see JEWS.

Ju'das, the betrayer of Jesus and named Iscariot, probably was a native of Kerioth in Judah and, if so, the only southerner among the twelve disciples. See the *Gospels*, the *Lives* of Jesus by Neander, Farrar and Edersheim and the essay by De Quincey.

Jud'son, Adoniram, one of the earliest American missionaries, was born at Malden, Mass., Aug. 9, 1788. He, with Mills, Newell and Nott, applied to the Congregational association of Massachusetts for aid in carrying the Gospel to the heathen. This resulted in the formation of the American Board, and in 1812 Judson sailed for India. It was nearly a year before the missionaries were allowed to begin work in Burma, preaching, writing and translating. In 1833 he completed the translation of the Bible, and followed it by the publication of the Burmese dictionary. He made two visits to the United States, being received with great enthusiasm by the churches. His union with the Baptist denomination, soon after reaching Burma, was the occasion of the origin of the American Baptist Missionary Union. Judson died at sea, on his way to Mauritius in search of health, on April 12, 1850. See *Life* by Wayland, that by Judson and *History of the Burmese Mission* by Mrs. Judson.

Ju'dy. See PUNCH.

Juggernaut (*jŭg'ẽr-nạt*), a sacred town of India, containing the temple of the Hindu god Juggernaut, whose name means Lord of the World. The god is first mentioned in 318 B. C. The grounds include 120 temples, the chief one having a tower 192 feet in height. There are 24 festivals annually held in his honor. The great festival is when the god is dragged on his car, 45 feet high and 35 feet square, with 16 wheels, each seven feet in diameter. He is taken to his country house, and, though the distance is only a mile, the great weight and the heavy sands make the journey one of several days. It was thought formerly that the worshipers threw themselves under the chariot wheels as a sacrifice to the god, but probably the deaths occurred from accident. The word, however, has become fixed in our language to represent that which marches on, riding over everything in its way. See *Orissa* (in Bengal) by Sir W. W. Hunter.

Jul'ian, called the Apostate, because of his giving up Christianity. Born at Constantinople in 331 and half-brother of Constantine the Great, he became Roman emperor from 361 to 363 A. D. His boyhood was embittered by a terrible tragedy. He was bred a Christian, studied philosophy and literature, and at Athens embraced paganism. About 355 he showed himself a good soldier. He overthrew the Alamanni, conquered the Frankish tribes along the Rhine and made his winter-quarters at Paris. The people liked him because he lightened their burdens; the soldiers, because of his courage, success in war and simple private life. In 360 Emperor Constantine became alarmed at his popularity, and ordered him to send some of his best troops against the Persians. His soldiers rose and proclaimed him emperor. His cousin's death opened the government of the world to Julian. He reformed the civil service, persecuted neither Christians nor Jews, but reopened the old temples and tried (with poor success) to bring back the old religion. In 363 he marched against Persia, but was wounded. An old writer asserts that he cried: "Thou hast conquered, O Galilean!" which, whether he said it or not, was the fact. He died June 26, 363. See G. H. Rendall's *The Emperor Julian;* Ibsen's *Emperor and Galilean;* and Gibbon's *Rome*.

Jul'ius, the name of three popes.

Jul'ius II, a nephew of Sixtus IV, was born at Albezuola, Italy, in 1443. He became pope in 1503. His whole career was given to reëstablishing the papal power over the territory it had once had and to driving foreign rule out of Italy. To force Venice to give up the old papal provinces on the Adriatic, Julius entered the League of Cambrai with Germany, Spain and Louis XII of France. On the submission of Venice, he at once, fearing Louis's designs, entered the Holy League with England and Spain against France. Ranke describes him as "a noble soul, full of lofty plans for the glory and weal of Italy." He died on Feb. 21, 1513.

July, the seventh month in the year in our calendar, the fifth in the Roman calendar, where it was called *Quintilis* (the fifth). At first it had 36 days, then 31, then 30, and was restored to 31 by Julius Cæsar, in honor of whom it was named July. The July revolution is that of France in July, 1830, by which Charles X was set aside and Louis Philippe became king.

Jump'ing Mouse, a small field and forest-mouse of North America, having very long hind legs and capable of jumping eight to fifteen feet at a single bound. The body and head together are about three inches long, and the tail, while variable, is often five inches in length. The hind-legs and manner of using them always remind one of a kangaroo. In color it is reddish-brown above and white below. It feeds on seeds and grain, is nocturnal in its habits, and is only rarely seen in the daytime.

Jun'co a member of the finch family and a hardy little bird unafraid of winter's cold, is sometimes known as the slate-colored snowbird. It belongs to the woods of the north. Naturally shy, it is not infrequently emboldened to join the chickadees and sparrows in accepting man's hospitality, offered when deep snow makes lean pickings for feathered folks. In winter it feeds chiefly on weed-seeds and grain. It is about the size of the English sparrow, a small, trim bird robed in neatest Quaker uniform; its coat dark slate-color, a blackish hood fitted snugly about the head, then a slate colored breastplate; under part dull white, and white on the outer tail feathers. When disturbed, juncoes twitter and fly away, sometimes uttering what Chapman describes as a "sharp, kissing call." During the nesting-season a simple trill or low, sweet warble is heard.

WHITE-WINGED JUNCO

June, the sixth month of the year in our calendar and the fourth among the Romans. It first had 26 days, to which four were added by Romulus, one was taken away by Numa, and the month again lengthened to 30 days by Julius Cæsar.

Juneau (*jū' nō*), the capital of Alaska, is a town of 2,000 to 3,000 people, situated in the southern district, near Douglas Island. It is the center of a large import and export trade. Besides gold, furs are the chief article of export. A submarine cable now connects Juneau with the United States. The town has a few manufactures, the most important being its ironworks.

Jungfrau (*yo͝ong'frou*), meaning the maiden, a magnificent peak of the Bernese Alps, reaches a height of 13,671 feet. It obtains its name probably from the purity and dazzling brightness of the snow which covers it. Its summit was first reached by two Swiss, named Meyer, in 1811. A railroad is built from Lauterbrunnen to its summit.

Ju'niper, species of *Juniperus*, a genus of conifers, containing about thirty species widely distributed throughout the northern hemisphere. The junipers are characterized by their opposite or whorled leaves, and are peculiar among conifers in that the cone ripens into a berry-like fruit. The most common species of the northeastern states are the common juniper (*J. communis*), which occurs either as a small tree or shrub or as a prostrate form; the savin (*J. Sabina*), which is a prostrate or sometimes creeping shrub throughout the northern regions; and the cedar (*J. Virginiana*), which is common on dry hills or in deep swamps and has a shreddy bark and a red, aromatic, hard wood.

JUNIPER

Junius, Letters of, seventy letters of political character, which appeared in the *Public Advertiser* of London between January, 1769, and January, 1772. For publishing the letter to the king, Woodfall, the proprietor of the *Public Advertiser*, was prosecuted, but was acquitted on a legal point; but a bookseller was punished for selling a reprint. These letters attracted the widest attention, because of their unknown author's boldness and his seeming familiarity with politics and well-known persons. It certainly was bold in that day to say, as Junius said to George III: "Remember that while the crown was acquired by one revolution, it may be lost by another." A dozen or more leading writers and politicians were suspected of hiding under the name of Junius. But the man most commonly held to be the writer is Sir Philip Francis, and this theory was adopted by De Quincey, Macaulay, Stanhope and other critics; yet there is no direct evidence connecting Francis with the authorship. The *Letters of Junius* were more polished than those of any writer of the day. They were the first of modern newspaper editorials. See Dilke's *Papers of the Critic*.

Juno (*jū'nō*). The Romans gave a god to everything existing—to a man, to the tree, to the state, to the storeroom. So Juno is the goddess of womanhood, and the various titles given her are of the different parts of a woman's life, as Juno the goddess of birth, of marriage etc. This personification of feminine functions became identified with the Greek goddess, Hera, who became known to the Romans through Greece at an early time. In this way Juno came to be considered the jealous wife of Jupiter, as represented in Vergil, as Hera (*q. v.*) is the spouse of Zeus in Homer.

Junot (*zhü'nō'*), **Andoche, Duc d' Abrantes,** one of Napoleon's famous generals, was born at Bussy-le-Grand, France, Oct. 23, 1771. He entered the army as a volunteer in 1792. His courage at Toulon caught the eye of Napoleon who carried him with him to Egypt as adjutant. At Nazareth he put 10,000 Turks to flight with but 300 horsemen. He was made governor of Paris, ambassador to Portugal and, in 1807, given command of the army for the invasion of that country. In a short time he had possession of all the strong places in the kingdom. For his brilliant success he was made Duc d'Abrantes and governor of Portugal. But he was soon defeated by Wellington (then Sir Arthur Wellesley) at Vimiera, and forced out of Portugal. He afterward served in Germany and Russia, and was made one of the scapegoats for the Russian disaster and sent to govern Illyria. This disgrace, together with former wounds in the head, brought on insanity. He died on July 29, 1813.

Ju'piter. See PLANETS.

Jupiter, the chief god of the Romans. He was first the divinity of the sky, of thunder and of lightning. He was the supreme spirit above other gods, and as such was besought to give victory in war. He also was the god of the vintage and of oaths. When, however, the Romans came to know of the Greek gods, the myths and stories told of Zeus were applied by Latin poets to Jupiter. Statues of Jupiter came to be made, and the Roman god came to be, as Zeus was, merely a greater man. The famous temple of Jupiter stood on the Capitoline hill at Rome, and was built by Tarquin.

Ju'ra, a range of mountains extending from the angle formed by the Rhône and the Aar northeastward for over 450 miles. By Jura, however, is usually meant only the part along the frontiers of France and Switzerland. The highest peak is Reculet, 5,643 feet in height. The eastern slope is much steeper than the western one. The ranges are broken by many cross-gorges. Limestone caves are numerous, and abound in magnificent stalactites and in bones of extinct animals. Some good-sized rivers sink into the ground and reappear after some distance. The Jura Mountains are of a peculiar limestone formation, which geologists call jurassic.

Jury, Trial by, is a form of trial of very ancient origin, in which a body of sworn men, generally 12 in number, are called upon to judge of the truth of the facts of a civil or criminal case. In England, even under the Saxons, it was the custom for 12 thanes to be chosen to prosecute malefactors in the county court. But this was rather like a grand jury, such as still meets in England to judge whether a prosecution is justified. It would seem that trial by jury in criminal cases only gradually came to supplant the curious practice of trial by ordeal. A jury has nothing to do with the sentence conferred, but only with the judgment of the facts submitted in evidence and summed up for them by the judge.

A jury is summoned by a writ, the jurymen being taken by chance from among such citizens as are eligible for the office. The final selection of 12 is made by lot under the direction of the presiding officer. As the clerk of the court calls the names, the jurors take their seats, but it is permitted that the prosecutor and defendant or their counsel may challenge undesirable jurors, who then are excluded and their places filled. The prosecutor or plaintiff or his lawyer addresses the jury and brings forth his witnesses. These witnesses are cross-examined by the other side; which then presents its case and its witnesses. All this procedure and the final summing up by the judge are addressed chiefly to the jury, which is the sole judge of questions of fact. The chief objections to trial by jury are the difficulty in getting all the jurors to agree, without which result there can be no verdict, and the danger of prejudice on the part of some of the jurors. The latter defect may be disregarded, or perhaps it is less to be feared in case of a jury of 12 than of a single judge. The jury may be locked up until they agree, or until the judge decides that an agreement is not likely to be reached. In the case of a disagreement a new trial may be ordered. Probably trial by jury is much more suitable for criminal than for civil cases, in the later of which one has to decide by probabilities rather than rely, as in criminal cases, upon proof positive.

Justin'ian I, nephew of Emperor Justin, was born in Illyricum in 482 or 483 A. D. Although slave-born, he shared in his uncle's success, and was given a good education at Constantinople. He was made a consul in 521. In 527 Justin proclaimed him his partner in the empire, and died four months afterward. His reign of 38 years is the most brilliant in the history of the later empire. Under the direction of the famous generals whom he chose, the famous Narses, Belisarius and others, the Roman empire was widened to its old limits and east and west united. Justinian, however, is most famous as a lawgiver. As soon as he gained the throne, the constitutions or imperial statutes were gathered and reduced to a code. But these statutes were but a small part of the law. The bulk of it — what we would call the common law — was contained in the writings of the jurists or law commentators. Of these writings there were many hundred volumes; but, owing to want of agreement between the writers, the law was very uncertain. Hence the famous Tribonian, with four associates, was instructed to prepare a single treatise which should cover the whole ground. This great work was accomplished in four years, and was published in fifty volumes, known as the *Digest*. On the same day — Dec. 31, 534 — Tribonian brought out a law-treatise, which Justinian caused to be prepared as a textbook for students. It is known to all modern lawyers as Justinian's *Institutes*. Justinian also bettered the condition of the slaves, taking away from their masters the power of putting them to death. He was an able ruler, and his intentions in the main were just and upright. He died on Nov. 14, 565. See his *Life* by G. Body.

Jute is the fiber taken from the bark of two plants, both of the lime-tree order, with yellow flowers. The larger plant is from five to 14 feet high, and is grown in central and eastern Bengal; the other, slightly smaller, is grown around Calcutta. The fiber is separated from the stem by steeping in water, which takes from two days to three weeks. The best kinds are pale yellow or buff, with a silky luster, easily spun and strong. Jute is used in making ropes, gunny bags, carpets, curtains, table-covers and other fabrics. Jute can be raised and manufactured cheaply, but is not so strong or so lasting as flax. Fabrics made of jute are easily rotted by damp, and cannot be often washed and dried, like linen and cotton, without injuring them; but there is fraudulent mixing of jute with cotton, flax, silk and woolen fabrics. India is the great jute-producing country. The United States yearly import millions of dollars worth of jute and jute-goods. Jute thrives in our gulf states, but production here has not been successful.

Jut'land, the only peninsula of any size in Europe which points directly north, has since early in the 10th century belonged to Denmark. It extends along the North Sea, northward to the Skager Rack, which separates it from Norway, and is flanked on the east by the Cattegat, which separates it from Sweden. It covers an area of 9,904 square miles. Here the Jutes lived in the fifth century, who took part in the Anglo-Saxon descents on the English coast. Population 1,124,694.

Ju'venal, Roman satirist, was born about 55 A. D. in the Volscian country where his father, a free Roman citizen, owned an estate. He was educated at Rome, and became the friend of Martial and Quintilian. Probably under Titus or early in Domitian's reign he served as tribune in the army, and in his native town of Aquinum he filled the office of censor and held other important posts. An inscription tells us that he was in Britain, and he is also known to have visited upper Egypt. All of his writings that are left are 16 satires; but these are of great value in themselves as literature and as pictures of Roman life under the empire. Perhaps the finest are the first five satires, written when the author was fresh from a living experience of Domitian's brutalizing government. The most popular now probably is the tenth, *The Vanity of Human Wishes*, which was imitated by Dr. Samuel Johnson. Juvenal used satire, not as a branch of comedy, which it was to Horace, the other great Roman satirist, but as an engine for attacking the tyranny, crimes and follies of his time. He died in 140 A. D.

Juvenile Courts. These are the latest means by which we are trying to distinguish between the young offender against the law and the hardened criminal, and in general to fight the great increase of crime which seems to exist among the young, especially in the larger cities of the world. Although for centuries children under seven have not been counted responsible for any criminal act they might commit, children over that age were until comparatively recently tried in the same courts and on the same general principles as those applied to adults. It was felt that this tended to make criminals out of young people who at heart were not vicious. Therefore for many years there have been reformatories to which the younger prisoners were sent, instead of to jail. But it became clear that to send a boy to a reformatory put a brand on him for life. Merely to be tried in open court with adults and hardened prisoners was to put a blot on the life of the child. Hence it has been the custom for many years in New York and in other states and in most European countries to suspend sentence on the young offender and to hand him over, where possible, to some responsible person, who would try to keep him at school or send him to work, according to his age, and would report to the judge how the boy (or girl) was getting on. The well-known George Junior-Republic was and is peopled for the most part by such probationers. But the juvenile-court law of the state of Illinois, passed in 1899, elevated this custom into a law and further required that in the cities of that state the children (boys under 16, girls under 17) should be tried in a separate court and with the purpose rather to reform than to punish. In 1903 Colorado passed a juvenile-court law which causes all under 21 to be regarded as children and includes this most important provision — that those adults, parents or employers or others, who are responsible for the child's "delinquency," are liable to fine and imprisonment. In 1905 this provision was included in the law of Illinois Since then New York and more than 20 other states, especially those that have large cities, have passed similar laws. In the trial of the children by the children's judge the state takes the position of a parent, not desiring to punish the child for what it has done but rather to help him get on his feet and lead a good and worthy life. Recently in Chicago, New York and other cities much good has been done by volunteer probation officers, men of means and of some leisure, who have each one adopted the position of "big brother" to some young boy brought before the court, and have tried to help him up, especially by finding him work, giving him a change of life now and then, and by showing sympathy and friendship.

K

K (*kay*), the eleventh letter, is a nonvocal consonant. It is called a guttural, because made by the soft palate closing on the back of the tongue, as in *ask*, *kill*. In such words as *cracked*, *k* prevents *c* before *e* from being pronounced as *s*. Before *n* in the same syllable, *k* is silent, as in *knot*.

Kabul (*kä′bul*) or **Cabul** was made the capital of Afghanistan by Timur in 1774. It stands 6,000 feet above the sea, and is overshadowed by the once famous fortress of Bala Hissar. The city has a large trade with India and Central Asia; its bazar rivals that of Kandahar; and it is noted for its fruits and its carpets. It is the seat of the reigning emir, and has a mint, a gun-factory and a modern arsenal. Kabul was captured twice by the British (1842 and 1880). Hindus, Jews and Afghan tribesmen make the population (75,000).

Kaf′irs, tribes inhabiting the southern portion of the African continent, particularly the coast of southeastern Africa. Their color is not so dark as that of the negroes, though their hair is woolly and they have broad noses and thick lips. Northward they become darker, until at last they blend with the negroes, and their distinctive racial features are lost. They are brave and, for the most part, kind and affectionate to their families. Polygamy is almost universal, wives being purchased with cattle. Their idea of the Supreme Being is very indefinite, but, although deficient in religious sentiment, they are superstitious, and belief in witchcraft is very general. There are some signs of a belief in a future state, the most marked being the worship of their ancestors.. Their number is estimated at 2,400,000, chiefly in Cape Colony, Natal, Transvaal and British Bechuanaland.

Kafiristan (*kä-fē-rēs-tän′*), a country of southern Asia, on the southern declivity of the Hindu-Kush Mountains. The area is about 5,000 square miles, and the inhabitants differ from surrounding tribes both in language and religion, all efforts to convert them to the Mohammedan faith having been in vain. They number about 200,000, and are divided into various tribes, which often war with one another, but are united in their love of independence and their hatred of Mohammedanism. Kafiristan, whose native tribes were subdued by the emir of Afghanistan in 1895, has been of late included in the countries under Afghan control, and has been garrisoned partially by the emir's troops. The soil is fertile, yielding sufficient fruit and grain for the inhabitants and furnishing subsistence for large herds of cattle, sheep and goats.

Ka′kabe′ka Falls. Near Port Arthur and Fort William in Thunder Bay District Ontario. There is a development of 12,000 horse-power electrical energy, and arrangements are being made to utilize the falls to the extent of an additional 30,000 horse-power. The power from these falls supplies Port Arthur and Fort William.

Kal′amazoo′, a city in Kalamazoo County on the river of the same name, southwestern Michigan, noted for its great beauty and the enterprise of its inhabitants. It is situated on the river of the same name, about 40 miles from the eastern shore of Lake Michigan and 140 miles from Detroit. It is reached by a number of railroads; and the city possesses, besides a number of fine churches and schools, the western state normal school and Kalamazoo College, a public library and several music-academies. Kalamazoo has nine paper-mills, stationery and card factories. The Michigan asylum for the insane is located here. Population 39,437.

Kaleidoscope (*kȧ-lī′dȯ-skōp*), an ingenious and pleasing optical instrument invented by Brewster in 1817. In its simplest form it consists of a tube in which are placed two mirrors or reflecting planes so hinged together along one edge as to make an angle with each other which is an aliquot part of 180°; while one end of the tube is fitted up with an eye-glass, and at the other end are two glasses, between which are placed little fragments of colored glass or other objects which it is desired to examine. The eye, looking into the tube, perceives these objects reflected many times. There are various modifications of the kaleidoscope which increase its power. It is sometimes used by designers of patterns, to whom it furnishes an almost endless variety of figures.

Kal′mucks, a branch of the Mongolian family inhabiting extensive regions in the Chinese and Russian empires. The Tartar name *Khalimick* signifies renegades. There are four principal tribes. They are a nomadic race, with a barbaric history running back through many centuries. The descendants of the famous Genghis Khan still rule one of the tribes. Wealth with them consists chiefly in flocks and herds. In Russia there now are about 120,000 Kalmucks, living mostly in Astrakhan. In religion most are Buddhists, but some are Mohammedans and a smaller number Christians.

Kama (*kä'mȧ*), the principal branch of the Volga, rises in the Russian province of Vyatka, and after an almost circular course of 1,000 miles joins the Volga about 40 miles below Kazan. The Kama is navigable from Perm, a distance of over 900 miles. It is free from ice a little more than half the year, and is one of the most important highways of commerce between Siberia and St. Petersburg.

Kamchatka, (*kȧm-chȧt'kȧ*), also spelled *Kamschatka*, a peninsula of eastern Siberia, stretching into the Pacific, between Bering Sea on the east and the Sea of Okhotsk on the west. It covers an area of nearly 150,000 square miles, although the population is under 10,000. Fishing and hunting constitute the chief occupations of the inhabitants, and furs are the most valuable production of the peninsula. Kamchatka was annexed to Russia at the close of the 17th century; and in 1855 was incorporated with the maritime province of Siberia. See Kennan's *Tent-Life in Siberia*.

Kamehameha (*kä-me-hä'me-hä*), the name of five kings of the Hawaiian Islands, who ruled successively from 1811 to 1872, except during the regency of two queens of Kamehameha II in 1824-33. Kamehameha II was the first king who became undisputed sovereign of the entire group. He died in 1819, a few months before the first American missionaries sailed for his country. Kamehameha III, who reigned from 1824 to 1854, is called Kamehameha the Good, on account of his liberal disposition toward his people and his active interest in their welfare. In 1840 he adopted a written code of laws and in 1852 a written constitution. Under his liberal administration a large portion of the common people became owners of land in fee simple. Great progress was made in religion, education and commerce during the 30 years of his reign. He died on Dec. 15, 1854. See HAWAII.

Ka'merun', a German colony in western Africa, north of French Congo, which was acquired in 1884. It has an area of 191,130 square miles, with a population estimated at 3,500,000, chiefly Bantu and Sudanese negroes, the whites numbering less than 1,000. The colony extends northeastward to Lake Chad, and has a coast line on the Bight of Biafra of 200 miles. Gold and iron have been found. The exports are rubber, ivory, horns, cocoa and oil fruits. Its name is derived from the river, which enters the Bay of Biafra by an estuary over 20 miles wide, and for a considerable distance is nearly a mile wide. The swamps along its banks make the climate trying for Europeans, but the country is very fertile. Northwest of the river's mouth lie the Kamerun Mountains, a volcanic group which in one peak, Mongoma Lobáh, the Mount of the Gods, reaches the height of 13,746 feet.

Kam'imu'ra, the Japanese vice-admiral who was appointed to blockade the Russian port of Vladivostock while Togo blockaded Port Arthur, won for himself a reputation second only to that of Togo. During the early part of the war he once or twice allowed the Russian fleet within the harbor to evade him. He encouraged this fleet to attempt to unite with the Port Arthur ships; intercepted them on Aug. 14, 1904; and sank the cruiser *Rurik* during a long stern chase, driving the other vessels back to port. In the great battle of the Sea of Japan on May 27 and 28 Vice Admiral Kamimura directed the armored cruiser squadron which annihilated the Russian cruisers.

Ka'mloops, a town in British Columbia, situated at the confluence of the Thompson Rivers. It is the center of supply for a large mining and grazing district. Population 2,000.

Kana'kas are the people who were found inhabiting the Hawaiian Islands when Cook discovered them in 1778. They are reddish brown in color, with black and straight hair, sometimes a little wavy, thin beards, the face broad, with a rather flat sideview or profile, the nose somewhat flattened and the lips thick. They are of only moderate height, except the chiefs and their families, who are remarkably tall and large. When discovered, they were given to barbarous customs, as the killing of superfluous infants, human sacrifices and the eating of the heart and liver of the conquered foe. Yet they naturally are good-tempered, light-hearted, fond of amusement and devoted to riding and swimming, especially to riding the heavy surf-breakers, in which they are remarkably expert. But the coming of the whites seems to have introduced habits of drunkenness and to have brought diseases against which their constitutions cannot stand. Cook thought there were 400,000 when he saw the islands first. In 1823 there were but 142,000; in 1872 42,000, and at present there are still fewer. The natives are giving way to Japanese and Portuguese laborers on the sugar-plantations.

Kandahar (*kȧn-dȧ-hȧr'*), the largest city in Afghanistan, is situated about 200 miles west of Kabul. Kandahar is a place of extensive commerce, and among its residents are a number of Hindu and Persian merchants. The city is surrounded by a wall four miles in circumference, 25 feet in height and from 10 to 15 thick; and two miles north is a precipitous rock, crowned by a fortress impregnable to attack, save by the heaviest artillery. The town is supposed to have been founded by Alexander the Great, although the name is Persian. During the wars of 1879–81 the British entered Kandahar unopposed, and held the city for several months after they had evacuated the rest of Afghanistan. Population 30,000.

Kane (*kān*), **Elisha Kent,** an Arctic explorer of renown, was born at Philadelphia on Feb. 3, 1820. He graduated in the medical department of the University of Pennsylvania in 1842, and entered the United States navy as a surgeon in the following year He commenced his remarkable career as an Arctic explorer in 1850 accompanying the Grinnell expedition in search of Franklin In 1853 he was made commander of a second expedition for the same purpose. The object of this expedition was never attained; and, after undergoing the greatest hardships and privation during two winters, it was finally resolved to abandon the ship and return home. Kane reached Philadelphia in October, 1855, and soon after published a narrative of the expedition. He died at Havana, Cuba, Feb. 16, 1857. See *Life* by W. Elder.

Kanem (*kä'nĕm*) is a small Moslem state lying north of Lake Chad, with an area of about 170,000 square miles and a population of 2,000,000. Its capital is Abeshr, the southern terminus of the caravan route from Benghazi on the coast of Tripoli. It accepted the protectorate of France during the summer of 1903.

Kangaroo (*kan'ga rōō'*), a pouched animal of Australia, with very large hind limbs and short front ones. The giant kangaroo was found near the coast by Captain Cook in 1770, on his voyage to Australia, but it is now driven into the interior. Large males attain a height, when erect, of seven feet. The hind legs and tail are enormous. Kangaroos often sit erect on the tail and hind legs. They ordinarily jump nine or ten feet, but, when hard pressed in pursuit, will make 15 or 20 feet at one leap On open ground they are more than a match for the fleetest dogs. They live on the open plains feeding on the herbage, are entirely herbivorous and owing to their close cropping do much damage. Because of this and the value of their flesh and hides they are persistently hunted. As a rule they prefer open spaces, but some kinds live among shrubs and one species is a tree-climber. There are several varieties of kangaroos, all living in Australia, Tasmania and New Guinea. They have a pouch in which the young are reared and into which they retire for shelter and food, until they reach, in the larger species, a weight of ten pounds. Often they may be seen with their heads thrust out from mother's pouch.

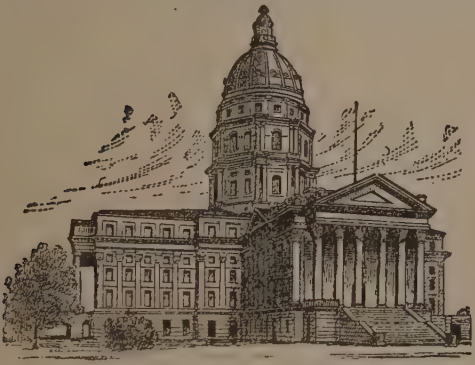
KANGAROOS

Kan'kakee', Ill., the capital of Kankakee County on the river of the same name, in northeastern Illinois, 55 miles south of Chicago. It is in a fine agricultural region, near considerable fields of coal, building-stone and bog-iron ore. Limestone is quarried also in the neighborhood. Here is the Eastern Illinois Hospital for the Insane. The city is provided with excellent schools, both public and parochial, besides having a seminary (St. Joseph's) and a conservatory of music. It has several fine churches, a public library and a Y M. C. A. building. Kankakee possesses excellent waterpower for its industries, prominent among them being piano, wagon and furniture factories, a knittingworks, sewing-machine and agricultural implement works and foundry products Besides, it has flour-mills, starch works, cigar factories, and makes bricks, tiles, mattresses, etc. Kankakee has the service of the Illinois Central, and Big Four Railroads. Population 13,986.

Kan'sas was admitted in 1861 as the 34th state of the Union. It is the central state, nearly equidistant between the Atlantic and Pacific oceans and from the northern and southern boundaries of the United States, and is bounded on the north by Nebraska, on the northeast and east by Missouri, on the south by Oklahoma and on the west by Colorado. Popularly, Kansas is known as the Sunflower State. It comprises an area of 82,144 square miles, extending 400 miles from east to west and 208 miles from north to south, practically all arable land. Its area is 60 per cent. greater than that of England and 175 per cent. larger than that of Scotland. New York and Maine together, or Indiana and Ohio united, would not equal its area, and it is larger than all New England, with Delaware and Maryland added.

STATE SEAL OF KANSAS

History. With the exception of a fraction in the southwest corner, Kansas was a part of the Louisiana Territory, sold to the United States by Napoleon in 1803, and then inhabited by Indians. The white pioneers endured great privations, hardships and peril. To protect the frontiersmen the government established military posts, the first being at Cantonment Martin, Atchison County, in 1818. Fort Leavenworth was established in 1827, and later Fort Scott and Fort Riley, the first and last still being among the most important of the country's military posts.


CAPITOL BUILDING

Kansas became a territory and was formally opened for settlement in 1854 by the Kansas-Nebraska Act, which repealed the Missouri Compromise and anticipated the extension of slavery on American soil. It was specified, however, that the electors of Kansas should decide whether it be a free or slave state. The friends of freedom and adherents of slavery at once inaugurated a vigorous campaign to settle the question according to their respective views. At the outset fraud and illegal methods characterized elections, turning the battle of ballots into one of bullets and changing the situation to one of violence and fierce contention. The bitter strife continued, increasing in intensity, and with the admission of Kansas to the Union on January 29, 1861, carrying a provision in its constitution for the prohibition of slavery, the great conflict of arms between the northern and southern states was begun. When war was declared, Kansas showed her loyalty by furnishing soldiers in excess of her quota and greater than the total of her voters. Thus it was that, as a territory and during the first years of statehood, Kansas was involved in almost continual warfare. This, with the hostility of the Indians and other vicissitudes, greatly retarded development, but the return of peace and the homecoming of the surviving veterans, with the immigration of other settlers attracted by the state's possibilities, marked the beginning of epoch-making progress.

Surface and Climate. The surface is a gently undulating plain, having a gradually increasing altitude from 750 feet at Kansas City on the Missouri to 3,906 feet at the western or Colorado border. In soil there is much diversity; from the dark, deep loam of limestone land, common in the eastern third, to the "plains" and sandy formations further west. Their comparative fertility is an unsettled problem.

The climate is without tropic heat or arctic cold. Extremes in weather, when occurring, are of short duration, and farm operations as a rule may be comfortably pursued almost without interruption throughout the year. The average temperature of December, January and February for 20 years has been 31° F.; of the three summer months 74°; and the annual average 53°. The average rainfall in the eastern third of the state for 20 years was 35.66 inches annually, gradually decreasing further west. For the whole state the annual precipitation has averaged 28 inches.

Agriculture. Kansas essentially is an agricultural state. The western portion for years was largely given over to grazing purposes, and in the early days it was not regarded as adapted to other uses, but as the population increases it is being more thickly inhabited, and general farming there has advanced materially and steadily pushed the line of reliable productivity to the western limits. These developments have come about through the increased skill of the farmer, whose general intelligence has been enlarged by the judicious agricultural educational system maintained and liberally supported, largely by the state. An element in this is the state's Board of Agriculture, with offices in the

Capitol at Topeka, which by its distribution of instructive and practically helpful literature to farmers is unique among such institutions and quite distinct from the agricultural college and experiment stations. Numerous farmers' institutes and other kindred organizations have, too, their helpful influences.

In the middle portion are the famous wheat-growing counties, and in the eastern half the great corn- and clover-counties, although corn and wheat are grown in every county, as is, with two or three exceptions, alfalfa, without doubt the state's most valuable forage-plant. The growing appreciation of alfalfa is indicated by its increased area since its considerable introduction about 1890 to 956,962 acres in 1909, placing Kansas first in acreage and production. Beetgrowing for sugar-making is a new feature, beginning experimentally in 1901. In 1906 one of the most modern beet-sugar factories in the world in construction and equipment was erected in western Kansas at Garden City, the center of activity in sugar-beet territory.

Kansas has inexhaustible supplies of pure water 10 to 200 feet beneath the surface, available for irrigation by windmill or other power, and this is being utilized extensively in numerous localities. Water from the Arkansas River and its underflow irrigates considerable areas in its fertile valley, although only a small portion of the total cultivated area is irrigated, and this is confined almost entirely to the valleys in the more western counties. Scarcely 50 per cent. of the area is under the plow, but the value of the total farm-products in 1909, with live stock on hand, was over $460,000,000. Statistics indicate the diversity of conditions by the variety of crops grown, there being annually reported cotton, hemp, flax, tobacco, sugar-beets, sorghums, broom-corn, Indian corn, wheat and other cereals and crops. The state perhaps is most conspicuous, however, as a wheat-raiser, and in the production of this grain ranks first. The yield in 1901 was nearly 100 million bushels, the greatest production by any state in one season. In the ten years ending with 1906 the state produced 707,480,388 bushels of wheat worth $424,339,237. By far the greater proportion of the wheat is grown in the central counties, popularly referred to as the wheat-belt. It is the corn crops, however, that have made the commonwealth rich, as it is on this crop that the immense meatmaking industries most largely depend. The largest yield was 273,888,321 bushels in 1889, and the most valuable was worth $78,321,653 in 1902. The area annually devoted to corn averaged in the ten years ending with 1906, 7,121,300 acres. The following table shows the quantities and values of several of the state's field crops in 1910:

		Quantities.	Values.
Corn	bu.	169,100,000	$76,095,000
Wheat	"	62,068,000	52,137,000
Hay	tons	2,061,000	16,076,000
Oats	bu.	46,620,000	15,851,000
Barley	"	5,400,000	2,430,000
Potatoes	"	5,016,000	4,514,000
Rye	"	532,000	388,000

The fruits, especially apples, pears, cherries, peaches, plums, grapes and berries of high quality, are extensively grown. The number of fruit trees in 1911 was of apple 6,511,887, pear 418,482, peach 3,980,945, plum 598,287, cherry 760,242, quince 15,327 and apricot 183,169. In small fruits there were 9,978 acres, in vineyards 5,346 acres and in vegetable gardens 25,246 acres.

Stock Raising. Animal husbandry is a most important branch of Kansas agriculture. The numbers of different kinds of animals on hand April 15, 1910, and their values were: horses, 1,147,056—$112,758,108; mules, asses and burros, 213,369—$26,668,453; dairy cows, 736,107—$24,297,388; other cattle, 2,343,296—$56,260,055; sheep, 272,475—$1,209,931; and swine, 3,000,157—$24,706,885. The value of the cheese, butter and milk sold in 1906 was $9,192,746. Dairying has come to be a prominent industry, making prosperous communities wherever followed. What is said to be the largest creamery in the world is at Topeka. The magnitude of the meat-making industry may be suggested by the statement that often more and seldom less than 50 per cent. of the entire number of cattle annually received at the Kansas City, Kansas, stockyards are furnished by Kansas. In this market there were received and disposed of in 1911, 2,122,162 cattle, 3,163,985 hogs, 2,175,619 sheep, and 84,776 horses and mules.

Manufactures and Mining. Many establishments, as those for glassmaking, brick, cement and smelting, have recently grown up in southeastern Kansas as the result of the development of its zinc, oil and gas-bearing fields. Natural gas has given great impetus to such industries. Cement factories are operating on extensive scales, with large capital invested in their properties. The smelting and refining of zinc in 1909 amounted to $10,857,000, and in this industry Kansas has long ranked first. Besides vast deposits of natural gas, petroleum, lead and zinc, the state's coal is mostly mined in the southeast, and the value of the output in 1910 was $7,914,709. Quarries of superior limestone, sandstone and gypsum are worked in the more central counties; underlying many of these is a seemingly inexhaustible saltbed; and but two states surpass Kansas in salt production.

Population. The state is divided into

105 counties; the smallest county is Wyandotte, with 153 square miles, but first in population, with 100,068 inhabitants, including Kansas City, the state's metropolis and the seat of the second largest livestock market and of the second most extensive meat-packing industries in the world. The last census, of 1910, showed the population of the state to be 1,690,949.

There then were 133 cities and towns having a population of 1,000 or more and twelve of these cities had 10,000 or more each, as follows: Kansas City 82,331; Wichita 52,450; Topeka 43,684; Leavenworth 19,363; Atchison 16,429; Hutchinson 16,364; Pittsburg 14,755; Coffeyville 12,687; Parsons 12,463; Lawrence 12,374; Independence 10,480, and Fort Scott 10,463.

Drainage. The state is watered and drained by several important non-navigable streams, viz: The Kansas (or Kaw), Arkansas, Republican, Solomon, Blue, Smoky Hill, Marais des Cygnes, Saline, Neosho, Medicine and Cimarron, besides innumerable smaller rivers and creeks. The larger streams in the main flow eastward or to the southeast, finding their outlets in the Missouri or the Arkansas.

Education. The laws are liberal and just, favoring sobriety, morality, industry, wholesome living and home-making. The manufacture and sale of intoxicating liquors, except for medical, scientific and mechanical purposes, is forever prohibited by a constitutional provision adopted in 1880. Intelligence is encouraged by liberally providing educational institutions and providing liberally for their support. Besides high schools in numerous counties and in all the cities and larger towns and the many colleges and academies, the state in 1910 had 9,300 free public-school houses, where 398,746 pupils were enrolled and 13,467 teachers employed, at an annual outlay of $5,773,342 for salaries. The schoolhouses and school-property are valued at $20,891,590. The University of Kansas, at Lawrence, takes rank with like institutions in older states, and the same is true of the Kansas Normal, at Emporia, while the Agricultural College, at Manhattan, is claimed to stand, in attendance, at the head of such colleges in the United States, having about 1,700 students (1910–11) and a teaching staff of 80. Many important denominational schools and colleges are liberally endowed and supported, and have a large attendance. The school for the education of deaf-mutes is at Olathe; that for the education of the blind, at Kansas City. Besides these there are the state's school for feeble-minded youth at Winfield; Soldiers' Orphans' Home at Atchison; Soldiers' home at Dodge City; Industrial reformatory at Hutchinson; Industrial school for girls at Beloit; Industrial school for boys at Topeka; Hospitals for the insane at Topeka and Osawatomie; Hospital for epileptics at Parsons; and penitentiary at Lansing. The federal government maintains a military prison and a national soldiers' home near Leavenworth.

Of railroads Kansas has more than 10,838 miles. Of the 105 counties one hundred have one or more railroads, and, excepting seven, all county-seats have one or more. Admirable natural roads, passable everywhere throughout the year, afford expeditious and comfortable travel and enable the marketing of farm-products at all seasons. F. D. COBURN.

Kansas City, Kan., an important railway center and county-seat of Wyandotte County at the junction of the Kansas and Missouri Rivers, which separate it from Kansas City, Mo. The town was organized in 1886 by the union of Wyandotte, Armourdale and Armstrong, and incorporated as a city. It has communication with Kansas City, Mo., by cable and electric roads. It is a great center of the live-stock trade of the west, and here is one of the largest packing-houses in the United States. In addition to the immense live-stock trade carried on here, there is a considerable trade done in grain, with many large grain-elevators and other facilities for handling and storing wheat and other grains in large volume. There also are several steam and flour-mills of large capacity, railroad car shops, machine shops, smelters, iron and steel works, cotton mills, a cement works, terracotta works, a journal-box factory, a malleable casting foundry, elevators, soap and candle factories. The city has excellent public and parochial school-systems and a magnificent high-school, and is the seat of Kansas City University, a college of medicine and surgery, St. Margaret's and Bethany hospitals, besides many fine public buildings. Some 15 bridges here connect the two rapidly-growing and populous cities. The population of Kansas City, Kan., is 82,331.

Kansas City, Mo., is located in Jackson County at the junction of the Kansas with the Missouri River, and the second largest city in the state, covering 27 square miles of territory. The older portion is built upon high hills formed by the bluffs of the two rivers, and thence sloping south and east into a delightful undulating country, which has been greatly beautified by parks and boulevards. These consist of 39 miles of boulevard, 227 acres in parkways, and 2,255 acres in public parks

Originally Kansas City was simply a river-landing about two and a half miles north of Westport. Here a town was laid out and the first lots sold in 1846. The town soon became the center of a thriving trade with New and Old Mexico and with the Indian tribes in the territory west and southwest.

Kansas City now sprang rapidly into prominence. To get into the country from the river, the bluffs and the hills had to be cut and leveled, and in no other American city has man made more radical changes in the natural contour of a location. The rapid growth of Kansas City is shown by the following statistics: In 1860 the population was less than 4,000; in 1870 it had increased to 32,260; in 1880 to 56,785; in 1890 to 132,716; in 1900 to 163,752, and in 1910 to 248,381, with 82,331 in Kansas City, Kan., just across the state line.

Kansas City is in the center of one of the finest agricultural, stockraising and fruitgrowing regions in the world. The soil, the climate and the enterprise and industry of the people have contributed to make Kansas City one of the greatest grain-markets in the Mississippi valley, while the live-stock market is second only to that of Chicago. The stock-yards, in convenience and equipment, are the best in the country. Their chutes, alleys, pens and tracks cover nearly two hundred acres. The packing and stock-yard interests are so closely allied that the one implies the other. The total daily handling capacity of the six great packing houses is 15,000 cattle, 36,000 hogs and 16,000 sheep.

It has about 1,400 manufacturing plants, and among her chief industries are flour mills, eight of the largest Portland cement plants in the west, the largest publishing house of military books in the United States, one implement factory, producing a general line of farm implements, also wagon, haypress, gasoline engine, tank, road machinery, scale and wheelbarrow factories and grain elevators.

Twenty-one systems of railroads enter Kansas City, making it the second largest railroad center in the United States. The public-school system is one of the most complete and economically managed in the United States, and has a greater proportion of pupils in its high schools than any other city in America. There are 59 public school-houses, 890 teachers and 34,000 pupils enrolled. The park and boulevard system, now far advanced toward completion, is destined to be one of the finest in the United States. Kansas City is preeminently a city of churches, theaters and public halls. The most noted public buildings are the public library, public school buildings, the city hall, convention hall, county courthouse and postoffice. Among the commercial centers Kansas City stands tenth in volume of business.

Kansas River. A river in Kansas, also known as the Kaw, formed by the union of the Smoky Hill Fork and Solomon Rivers near Abilene. Its length, including Smoky Hill Fork, is about 500 miles, little of which is practically navigable. Its main tributary is the Republican River. The Kansas empties into the Missouri, on the Missouri state line, at Kansas City, Kan.

Kansas University. A co-educational institution founded in 1864 and opened at Lawrence, Kan., in 1866, the land for the university being granted by act of Congress in 1861, when the state was admitted into the Union. The university was reorganized in 1889, when the three departments of literature, science and art were formed, including schools of law, engineering, pharmacy, music and the fine arts, with a preparatory course in medicine. The institution is under the supervision of a board of seven regents appointed by the governor and confirmed by the senate. The chancellor is named by the regents. Instruction is free to residents of the state, and only a nominal fee is paid by outsiders. Degrees are conferred not only in art and science, but in philosophy, law, medicine, music, painting and civil and electrical engineering. The teaching faculty is composed of 146 members, with a student attendance of 2,364.

IMMANUEL KANT

Kant, Immanuel, a philosopher of world-wide renown, was born at Königsberg, East Prussia, April 22, 1724, and died there on Feb. 12, 1804. Kant's parents were poor but respectable, his father being a saddler or strap-maker. At 18, Kant entered the University of Königsberg as a student of theology, but he soon gave up that profession and diligently applied himself to mathematics and the physical sciences. After supporting himself for years as a private teacher at Königsberg, Kant was appointed a professor in the university and continued teaching and lecturing there till his death. Although Kant was fond of books of travel, he never was more than 40 miles from his native town. He was temperate in his habits, patient and persistent in his work, and was much admired. The teacher's object, he always declared, should be to induce the habit of self-reflection in his pupils. While lecturing, it was his custom to fix his eye very closely on some student and judge by the face and eye of that one whether he was understood or not. Kant was the author of a large number of works, the most famous of which are his *Critique of Pure Reason*, his *Critique of the Practical Reason* and his *Critique of the Faculty of Judgment*. In his political views Kant may be counted as one of the foremost champions of liberty and progress. In respect to religion his supreme idea was that of duty and obligation, leaving but little room for the play of the feelings. "Whoever will tell me," he was accustomed to say, "of a good action done, him will I thank, though it be the last hour of my life." A short time before his death he said to his friends: "I do not fear death; if I were sure of being called away this night, I could raise my hand to heaven and say: 'God be praised!'"

Kar′nak, Egypt. See THEBES.

Karyokinesis (*kăr′ĭ-ŏ-ki-nē′sĭs*) (in plants), the process by which cells ordinarily divide, The name refers to the fact that this prevailing method of division begins with a division of the nucleus, and then involves the whole cell. The various steps by which the nucleus divides are exceedingly numerous and intricate, and furnish some of the most recondite of botanical problems. This method of cell-division is also often called mitosis or indirect division. See CELL.

Katahdin (*kȧ-tȧ′dĭn*), the highest mountain in Maine, U. S. A. It has an elevation of 5,000 feet.

KATYDID

Ka′tydid′, familiar insect, classed as a long-horned grasshopper. It is a great singer, known more by its song of "Katy did, Katy didn't; she did, she didn't" than by sight. These insects are difficult to see on account of their color, which matches that of the leaves of the trees and bushes on which they live. They sing by night, sing all night, do not come to the fore until midsummer or later. It is a popular fancy that the song of the first katydid means six weeks to frost, — the prediction being often fulfilled. The males are the music makers, and call to their mates with their music. By rubbing the fore-wings little membranes are made to vibrate, a sound produced that carries sometimes a quarter of a mile and seems like human speech. The song of the snowy tree-cricket is often mistaken for that of the katydid in sections of the country where the latter does not live. Katydids are of a lovely pale-green color; the wing-covers delicate, not stiff like a grasshopper; the hind-legs longer and more delicate. It flies prettily, is a good jumper, and walks more than does the grasshopper. The broad-winged katydid has wings that bulge on each side, giving the insect an appearance of plumpness. The eggs are laid in regular rows on leaves and branches. The angular-winged katydid is common in our southern states. Early in the autumn the eggs are laid, deposited in a curious, overlapping double row on twigs, edges of leaves, sometimes on the edge of a fence-board, gummed securely in their place. They do not hatch until spring; then the egg splits along the top edge and the young katydid comes forth, at first very pale in color. In the south there are two broods a year, in the north but one. The eggs are often stung by a curious chalcidid parasite. Katydids do but little harm to vegetation, are looked upon friendlywise. Oliver Wendell Holmes speaks thus to the katydid:

"I love to hear thine earnest voice,
  Wherever thou art hid,
Thou testy little dogmatist,
  Thou pretty katydid!
Thou mindest me of gentlefolks—
  Old gentlefolks are they—
Thou say'st an undisputed thing
  In such a solemn way."

Kaunitz (*kou′nĭts*), **Wenzel Anton,** PRINCE VON, an Austrian statesman and diplomat, was born at Vienna, Feb. 2, 1711. Kaunitz began his public career under Charles VI, and was afterward employed by Empress Maria Theresa on diplomatic missions to Rome, Florence and Turin. At the congress of Aix-la-Chapelle, in 1748, he earned the rank of minister of state by the diplomatic talents he displayed. As Austrian ambassador at the French court in 1750–52, he succeeded in changing the enmity which had existed between France and Austria for nearly a century into friendship and good-will. For this service he was appointed prime minister, and for more than 40 years had the principal direction of Austria's political affairs. He also was a liberal patron of the arts and sciences. He resigned all his offices and retired from public life when Francis II ascended the throne (1792). He died on June 27, 1794. See *Lives* by Hormayr and by Beer.

Kazan (*kä-zän′*), capital of the Russian government of Kazan and ancient capital of the Mongol kingdom, was founded in the 15th century. The city was taken by the Russians under Ivan the Terrible in 1552 after a bloody siege, and the Mongol kingdom was brought to an end. Kazan is one of the most important educational centers of Russia, the university founded by Alexander I in 1804 containing a library of 80,000 volumes, an observatory, a botanical garden, four faculties and 875 students. The yards in which Peter the Great built his Caspian fleet are not far from the town. Population 143,707. Kazan also is a province, area 24,587 square miles with a population of about 2,200,000.

Kean, Edmund, a distinguished English actor, was born at London in 1787. He exhibited signs of dramatic genius at an early age, and in 1814 made his début in Drury Lane theater in London in the character of Shylock. He at once took rank as the leading actor of the day, and his subsequent appearance as Hamlet, Othello and other Shakespearean characters showed still more clearly the greatness of his power and his mastery of all phases of tragic emotion. Unhappily his irregularities of life were as marked as his talents; and his reputation was well-nigh ruined by the case of Cox *vs.* Kean in 1825. After the trial Kean paid a visit to America, remaining till the close of 1826, and on his return home he re-appeared on the stage; but his powers of body and mind were so impaired that he seemed little more than a wreck of his former self. His last appearance was at Covent Garden, March 25, 1833, when he suddenly broke down and fell insensible into the arms of his son. He never appeared on the stage again, and died at Richmond on the 15th of May following. See *Lives* by Barry Cornwall, F. W. Hawkins and G. T. Molloy.

Kear′ney (*kär′nĭ*), **Neb.,** county-seat of Buffalo County, in the Platte River valley. It has good water-power, graded schools and numerous manufactories, besides the state normal school, a military academy, a Carnegie library and a state industrial school for boys. Kearney has the service of the Union Pacific and of the Chicago, Burlington and Qunicy. Population 6,202.

Kear′ny, a town in Hudson County, N. J., on Newark Bay, opposite Newark. Its chief manufacturing establishments are Marshall Thread Co. with 2,000 employees, Nairn Linoleum Works with 1,200 employees and Arlington Celluloid Works with 1,000 employees, besides manufactories of roofing-material, metal bedsteads and golf-balls. The town has good public and parish schools, the Sacred Heart Industrial School for Boys, the Soldiers' Home and several churches. It has the service of four railroads. As New Barbadoes it was settled in 1755, became part of Harrison later, and was incorporated in 1871 and named in honor of Gen. Philip Kearny whose residence still stands within the limits of the town. Population 18,659.

Kear′ny, Lawrence, a United States naval officer of considerable fame, was born at Perth Amboy, N. J., Nov. 30, 1779. He entered the navy as a midshipman in 1807. He served during the War of 1812 against Great Britain, and after it won great distinction by clearing the West Indies and the coast of the Gulf of Mexico of pirates. In 1832 he was promoted to the rank of captain, and in 1841 secured important commercial rights to Americans in China. He was made commodore in 1866, and died at Perth Amboy, Nov. 29, 1868.

Kear′ny, Philip, a soldier who distinguished himself in the Mexican War and in the War for the Union, was born at New York on June 2, 1815. He commanded a division in the Peninsular campaign in which he won an enviable reputation for courage and gallantry. He took an active part in the second battle of Bull Run and at Chantilly, Va., where he was killed by a Confederate soldier while reconnoitering in front of his command. His death, Sept. 1, 1862, was greatly lamented.

PHILIP KEARNY

Kear′ny, Stephen Watts, uncle of Philip Kearny, was born at Newark, N. J., Aug. 30, 1794; and died at St. Louis, Mo., Oct. 31, 1848. He entered the United States army in 1812, and served through various grades until 1846, when he rose to the rank of brigadier-general. At the beginning of the Mexican War in that year he commanded the Army of the West, which conquered New Mexico. After establishing a provisional government at Santa Fé, he marched to California and fought the battle of Pascual, in which he was twice wounded. On account of his services in Mexico and California he was brevetted major-general.

Kearsarge (*kēr′särj*), **The,** was the U. S. ship which in 1864 destroyed and sank that terror to commerce, the Confederate cruiser *Alabama*, and was shipwrecked in 1894. This vessel was named from a mountain in New Hampshire. The mountain reaches the height of 3,250 feet. A new battleship, *Kearsarge*, was launched on Aug. 8, 1907. She was said to be the first to leave the dry dock under steam.

Keats (*kēts*), **John,** author of *Endymion*, *Isabella*, *Hyperion* and other poems, was born at London in 1795. He attended a school at Enfield during his early years, and in 1810 was apprenticed to a surgeon. He practiced that profession for seven years, and then gave his entire attention to literature and especially to poetry. Although Keats lived only 26 years, his poetry displays genius of a very high order. He died of consumption at Rome in 1821. See *Life* by Lord Houghton and by Sidney Colvin.

Keble (*kē′b′l*), **John,** an English clergyman and poet, was born on April 25, 1792. At 15 he entered Corpus Christi, Oxford, where he won prizes and otherwise distinguished himself. In 1827 Keble published his volume of sacred poetry entitled the *Christian Year*, which attained a very large circulation and an influence that can hardly be overestimated. Keble was one of the leading spirits in what was known as the tractarian movement in the Anglican church, and for several years was actively engaged with Pusey, Newman and others in issuing *Tracts for the Times.* He died at Bournemouth, March 27, 1866. See *Memoir* by J. T. Coleridge and *Studies in Poetry and Philosophy* by J. C. Shairp.

Keene, N. H., a city, county-seat of Cheshire County, is about 43 miles from Manchester. Its leading industries are the repairshops of the Boston and Maine Railroad, shoe, glue, blind, tub, furniture and pail factories, a pottery and a woolen mill. The city, then known as Upper Ashuelot, was settled in 1734, and in 1753 became incorporated as Keene. It is on Ashuelot River, and has the service of two railroads. Population 10,068.

Kel'ler, Helen. In our biographies we are accustomed to speak of physical defects, poverty and other circumstances which make lifework more difficult at the outset, as misfortunes. An examination of the facts would indicate quite the opposite. The nervous stammer of Demosthenes, the blindness of Milton, Bach and Fawcett, and the initial poverty of almost all rich men seems to strongly indicate that what we call misfortunes are simply obstructions that tend to force concentration and singleness of purpose.

The high value of the sense of touch in mental development is one of the great facts of education that have been emphasized for us in such activities as manual training (*q. v.*) and the Montessori (*q. v.*) methods. In the case of Laura Bridgeman (*q. v.*) and Helen Keller the sense of touch gave the only access to minds and souls struggling for growth out of the dark and the educational triumph in both cases is one of the most inspiring and significant things in the history of human progress. It shows what can be done with this one faculty alone.

Helen Keller was born in 1880 in Tuscumbia, Alabama, endowed with all the senses. At the age of 18 months a serious sickness deprived her of sight and hearing. When she was six and a half, her parents read Charles Dickens' account of the wonderful work done with another deaf and blind girl, Laura Bridgman; and they sent for a teacher from Boston who might do the same for Helen Keller. Miss Sullivan came, and has with wonderful patience and skill taught Miss Keller to understand the pressure of another person's hand on hers, so that she can converse easily and quickly with her hands. By this means it is possible for Miss Sullivan to sit beside her and report the speech of a lecturer as fast as he utters it. Miss Keller has also learnt to utter words, though not perfectly. She can of course read the regular print used for the blind. She can also get something of a person's peculiarities of speech by placing her hand on the mouth and throat of the speaker. Her sense of smell is very keen, and is the source of many of her pleasures. She has actually succeeded in taking a regular college course at Radcliffe, with Miss Sullivan's aid; and she now writes fluently and well for *The Ladies' Home Journal* and other magazines. She has a wonderful imagination; and the way she speaks of visible things suggests that she still retains something from the first 18 months of her life when she could see and hear. She seems happy, and is thoroughly amiable under what would seem an intolerable burden of misfortune. See *The Story of My Life* by Helen Keller and *The Pop. Sci. Monthly*, May, 1903.

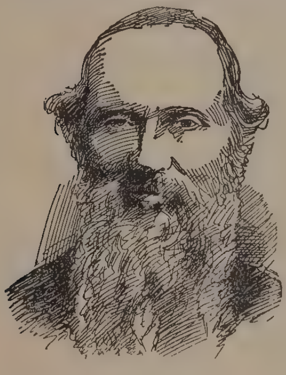
HELEN KELLER

Kel'logg, Clara Louise, an American operatic singer of rare gifts was born of northern parentage, at Sumterville, S. C., in 1842. Her musical education was obtained at New York city, and in the winter of 1861-62 she sang in its Academy of Music. Later she appeared in Her Majesty's theater in London, where she met with a brilliant reception and was engaged for the following season. She returned to the United States in 1872, and, after singing in all the principal cities, both north and south, accepted another engagement in London and sang with Nilsson at Drury Lane. After a tour on the European continent, including visits to St. Petersburg and Vienna, she retired in 1880, and appeared afterwards chiefly in concerts. The successes she met with were mainly in the rôles of Marguerite in Gounod's *Faust*, Rigoletto in the *Barber of Seville* and Lucia in *Lucia di Lammermoor.* In 1887 Miss Kellogg married Carl Strakosch, a nephew of Max Strakosch, the great impresario

Kelly, William, the inventor of the steelmaking process called Bessemer's or the pneumatic process, was born at Pittsburg, Pa., in 1811 and died at Louisville, Ky., in 1888. In 1847, while manufacturing iron, he discovered that for melted metal air is fuel and other fuel is needless. He saw a white spot at the edge of molten iron in a furnace. At this spot the iron was incandescent and almost gaseous, though no fuel was burning at this spot in the iron. Air alone was blowing on the spot. Now, air contains oxygen, iron carbon, and carbon and oxygen have what chemists call an affinity for each other. Kelly knew these facts. Hence he blew air into melted iron, the oxygen captured and carried away the carbon, pure iron was left, and modern steelmaking was invented. (See STEEL.) In 1851 Kelly built the first converter, in 1857 the first tilting converter. Learning in 1856 that Bessemer of England had patented the process in America, Kelly convinced the patent-office that he (Kelly) was the real inventor, and received a patent. Five years later his genius was recognized, Englishmen themselves acknowledging that Kelly discovered the process before Bessemer. The patent-office (1870) renewed his patent, because he had not received sufficient remuneration, and in seven years he received $450,000 in royalties. He remained in business till over 70 years of age. When he died, his process and our natural advantages had made America the second steel-making country of the world.

Kelts. See CELTS

Kel'vin, Lord, formerly Sir William Thomson, world-famed physicist and inventor, was born at Belfast, Ireland, in 1824. At the age of eight he removed to Glasgow with his father, a professor in the university. Kelvin graduated at St. Peter's, Cambridge, in 1845, being second wrangler and Smith's prizeman. Beginning in 1846, he filled the chair of physics at Glasgow University for 50 years. In 1866 he was knighted for his signal achievement in solving the scientific problems connected with the first Atlantic cable. In 1892 he was raised to the peerage. His contributions to physics are so numerous and cover so wide a range that it will be impossible to do more than allude to a few of the more remarkable ones. His contributions to science are contained in *Papers on Electrostatics and Magnetism, Mathematical and Physical Papers, Popular Lectures, Molecular Dynamics* (a course of lectures on *Light*) and his masterly treatise on dynamics, written in conjunction with Professor Tait of Edinburgh. His inventions and improvements of electrical measuring instruments, navigator's compass and deep-sea sounding apparatus have been of exceeding value to commerce as well as to science. Few men have ever lived who combine the mathematical ability and the experimental acumen which united in Lord Kelvin. Honors of all kinds from the presidency of the Royal Society down have been conferred upon him, including burial in Westminster Abbey. His death occurred on Dec. 1, 1907.



LORD KELVIN

Kem'ble, Frances Anne ("Fanny"), an English actor and writer, daughter of Charles Kemble, was born at London, Nov. 27, 1809. She first appeared at Covent Garden theater, London, in 1829, and in 1832 came to the United States with her father, and achieved great success. She married Pierce Butler of Philadelphia in 1834, and retired from the stage. The marriage was unhappy, however, a divorce was obtained and Mrs. Butler removed to Lenox, Mass. In 1849 she returned to the stage, appearing in many cities in this country and in Europe. Among her writings are *Francis the First*, a drama; *Journal; The Star of Seville*, a drama; *Poems; Plays; Records of a Girlhood; Notes on Some of Shakespeare's Plays.* She died at London on Jan. 15, 1893.

Kem'ble, John Philip, was born at Prescott, in Lancashire, England, Feb. 1, 1757. His father early designed him for the Roman Catholic priesthood, but such was his love for the stage that, in spite of his father's prohibition, he determined to become an actor. His first appearance was at Wolverhampton, Jan. 8, 1776, and in 1783 he played Hamlet at Drury Lane, London. When compelled to leave Drury Lane in 1802, he purchased a share in the Covent Garden theater, for which he paid £23,000, and made his first appearance there in 1803. He formally retired in 1817, and settled at Lausanne, Switerland, where he died on Feb. 26, 1823.

Kem'pis, Thomas a' was so called from Kempen, where he was born in 1380. He entered the Augustinian convent of Agnetenberg in 1407, and remained there until his death in 1471. His character stood high for piety and for learning; but his reputation rests mainly upon his writings, which consist of sermons, pious biographies, letters and hymns. His chief work was *The Imitation of Christ*, which has been translated into more languages than any other book except the Bible. See *Thomas à Kempis and the Brothers of the Common Life* by Kettlewell.

Ken'ilworth, a market town of Warwickshire, England, about five miles north of Warwick. The castle was a possession of the crown until 1563, when it was conferred by Elizabeth upon the earl of Leicester, who here entertained the queen for 18 days in 1565 at a cost of £1,000 a day. The entertainment has become famous from the description in Scott's *Kenilworth.* Population 4,545.

Kenilworth, the book, is one of Scott's novels. It takes its title from the famous little town of Warwickshire, England, and its once magnificent castle. The time of the story is 1565, and its characters include Queen Elizabeth, the Earls of Leicester and lovely Amy Robsart, Leicester's hapless wife. Its pictures almost compare for brilliancy and vividness with Shakespeare's own studies in English history. The scene between Elizabeth on the one hand and Liecester and Sussex on the other, whom she tries to reconcile, paints more impressive pictures on the mind than great historical painters put on canvas Yet the scene in which Elizabeth discovers the Countess of Leicester and in Amazonian fury drags her off to confront the man whom both women love, is still more dramatic. The tale ends in tragedy, through Leicester causing his wife to be murdered, and seldom have pity and terror been so blended. The Elizabeth, Leicester and Sussex of Scott live in literature beside the Henry V, King John and Richard III of Shakespeare.

Ken'nan, George, American author and traveler, was born at Norwalk, O., Feb. 16, 1845; was educated in the public schools and learned telegraphy; and in 1864 he was sent by the Russo-American Telegraph Company to superintend the construction of lines in Siberia. He there spent some years, returning to the United States in 1868. In 1870 he published a journal of his travels under the title *Tent-Life in Siberia.* In 1885 he returned to Russia, visiting the mines and prisons in Siberia. He gave an account of his experiences and observations in a series of articles in *The Century Magazine*, which afterwards appeared in book form as *Siberia and the Exile System.* Mr. Kennan has also published *Folk Tales of Napoleon*, *Campaigning in Cuba* and *The Tragedy of Pelee.*

Ken'nebec' a river of Maine, which rises in the western part of the state and flows southward into the Atlantic Ocean. Its length is 150 miles, and it falls about 1,000 feet, affording abundant water-power. It is navigable for large vessels for 10 or 12 miles from its mouth. Augusta, the capital of the state, is located on this river.

Keno'ra, a town of 5,200, formerly called Rat Portage, is situated 100 miles east of Winnipeg. There is a dam here across Winnipeg River which gives a head of 20 feet with a storage area (the Lake of the Woods) of about 2,000 square miles. In time not only Kenora and its mills but Winnipeg and other places with their industries will be supplied with power from these works, which have a capacity of about 30,000 horse-power. Kenora is a lumbering and milling center and an attractive summer-resort.

Keno'sha, Wis., the capital city of Kenosha County, on Lake Michigan, in the southeastern part of the state. It lies 33 miles south of Milwaukee and 50 north of Chicago, and, as it has an excellent harbor, is well situated for developing a substantial lake traffic. The Rambler automobile factory is situated in Kenosha, brass and iron beds are manufactured, and the largest sole-leather tannery in the world is operated Population 21,371.

Ken'sington Gardens, a public park in London, England, a little over two miles in circumference. In the western part is Kensington Palace, purchased by William III in 1689, which continued to be a royal residence for more than a hundred years.

Kent, James, American jurist, was born in New York on July 31, 1763. He graduated at Yale in 1781, and was admitted to the bar in 1787. After serving two terms in the legislature, he became professor of law in Columbia College from 1794 to 1798, when he was appointed a justice of the supreme court of New York. In 1804 he became chief-justice, and in 1814 chancellor of the state. In 1823 he retired from the bench, but continued the practice of his profession for many years. Kent's principal publication was his famous *Commentaries in American Law*, a monumental work which has not yet been superseded. He died at New York on Dec. 12, 1847.

Ken'ton, Simon, an American pioneer, who greatly distinguished himself by courage and sagacity in the wars with the Indians. Kenton was born in Fauquier County, Va., April 3, 1755. At an early age he had a quarrel with another young man on account of a rivalry in love, and, thinking that he had killed his adversary, he fled to Kentucky and became a companion of Daniel Boone. He took part in nearly all the conflicts with the Indians until Wayne's expedition in 1793 restored peace and tranquility to the western frontier. He also took some part in the War of 1812. As Kentucky filled with new settlers, a great portion of his lands, to which he had failed to secure a perfect title, were taken from him, and for many years he lived in penury and obscurity. At length, however, a pension of $240 a year was secured for him from Congress, and his closing years were made more comfortable. He died in Logan County, Ohio, in 1836, not far from the spot where he had once narrowly escaped being put to death by the Indians.

Kentuck'y is one of the central states in the east of the United States. It is bounded on the north by Illinois, Indiana and Ohio, on the east by West Virginia and Virginia, on the south by Tennessee and on the west by Missouri. Its extreme length from east to west is about 350 miles, and its greatest width from north to south is 170 miles, the area being 40,400 square miles. Kentucky is divided into three distinct portions — the mountainous regions of the east comprising about one eighth of the state; central Kentucky comprising about three eighths, and western Kentucky comprising the remainder.

Drainage. In and around the state Kentucky has a greater number of miles of navigable streams than any other state, a total of about 2,000 miles. On the east it is separated by the Big Sandy from West Virginia, on the north from Ohio, Indiana and Illinois by the Ohio River, and on the west from Missouri by the Mississippi River. The other navigable streams are the Tennessee, Cumberland, Kentucky (on which is situated Frankfort the capital), Green (a beautiful stream passing near the entrance of the famous Mammoth Cave), Licking, Barren and Trade Water Rivers. The Kentucky is noted for beautiful and picturesque scenery.

Surface. The 32 counties that compose the eastern region are covered with mountains from 600 to 2,500 feet in height. Between these ranges are many streams flowing through narrow though rich valleys. The wealth of this section consists mainly in inexhaustible supplies of minerals of various kinds. Central Kentucky is composed of rich limestone soil — not very level but sufficiently so to make it ideal farming land. Its natural drainage is almost perfect, so much so that there is very little swamp to be found. The continual disintegration of the limestone rock keeps the soil fertile. The surface of western Kentucky is generally level, intersected, however, by numerous creeks and small rivers.

Climate. In the lowlands along the Mississippi there is more or less malaria. The other districts are remarkably salubrious, the death-rate being exceptionally low. Statistics show that Kentuckians stand superior and at the top in size and strong physical characteristics. The temperature rarely reaches zero or goes higher than 90°. The average annual rainfall is 48 inches.

Soil. The lands along the many rivers are alluvial, the soil on some of the streams being from four to ten feet deep, notably in the Ohio and the Mississippi river-bottoms. Much of this is overflowed annually in the winter, from which deposits of rich soil are left, so that the fertility is inexhaustible. On many of these bottoms corn has been grown annually for 50 years without any diminution in production. The upland limestone section, including the famous Blue Grass soil, and a large portion of western Kentucky also are fertile, and are kept so from the yearly disintegration of the limestone and phosphatic shale which is very abundant and near the surface. Farms a century old, that have been properly managed, show no signs of exhaustion and do not require artificial fertilizers. This soil covers about 15,000 square miles. In the east the soil is generally fertile, even to the tops of the mountains; but, owing to its rugged surface, it is not well adapted to successful farming. All of this, however, is rich in timber and minerals.

Natural Resources. The state abounds in minerals of various kinds, the chief ones being bituminous and cannel coal, iron ore, petroleum, natural gas, asphalt, various kinds of building stone, pottery clay, terracotta and firebrick clay, molders and glass sands, pigment earths, lead, zinc and fluorspar. The coalfields cover 16,000 square miles, and the coal is mostly of superior quality. Cannel coal is found in several counties, and is mined in considerable quantities, most of it being shipped to Europe. Railroads are being rapidly built throughout the coal regions, thus bringing increased quantities yearly into market. Coal in the eastern counties is mined at low cost; no deep shafts and corresponding machinery are required; the strata show themselves in the sides of the mountains from which the coal is easily and rapidly secured and loaded into cars. In the lower parts of the coalfields four strata of iron ore are found. These ores yield from 33 to 53 per cent. of metallic iron. The ore and fuel for smelting it are found near each other, and hence require no long transportation to prepare the iron for market. Bessemer steel can be made from ores found within less than 75 miles of vast deposits of coking coal. The development of the coal and iron industries is large, and is increasing rapidly.

Petroleum is found in large quantities in several counties in the southeast. Portland cement and asphalt in large quantities and zinc, lead and fluorspar are found in different localities. Building-stones of various kinds are found in exhaustless quantities, and are not excelled in quality. Few states surpass Kentucky in the extent and quality of its hardwood forests. In the eastern part the river and creek valleys and the sides of the mountains are covered with a heavy growth of walnut, cherry, oak, poplar, chestnut, white and blue ash, birch, linden and white hickory. Through the central part there is very little timber of any kind, nearly all the land being in cultivation. In western Kentucky are found large forests of hickory, poplar, pine, chestnut and several varieties of oak.

Agriculture. This is the chief industry. More than 14,350,000 acres are under cultivation. The farm-products are varied, and several are produced in great abundance. The chief products are barley, buckwheat, corn, oats, rye, wheat, cotton, flax, hemp, sorghum, hay, tobacco and vegetables. Nearly 5,000,000 acres are devoted to corn, wheat, hay, hemp and tobacco. Kentucky produces nearly half the tobacco of the

United States. The yield in 1910 was over 381,000,000 pounds, an average of 810 per acre. The yield of corn was 105,270,000 bushels and that of wheat about 10,000,000 bushels. The state produces six times as much hemp as the remainder of the union. The orchard products are apples, peaches, apricots, cherries, pears and plums. Grapes are grown abundantly in almost all quarters. Stockraising is carried on extensively and is very profitable. Horsebreeding is one of its most important and profitable industries, and brings vast sums of money. Kentucky thoroughbreds are famous throughout the world. Thousands of mules are raised and shipped annually, to the cotton states. Large herds of the finest strains of cattle (notably the Durham and Herefords) are to be seen in many counties. Sheepraising is becoming very profitable, and the proportions of this industry are increasing yearly.

Manufactures. Kentucky has excellent natural facilities for manufacturing; her immense hardwood forests, her vast coalfields and her extensive natural waterways afford opportunities for profitable investment in almost all kinds of manufactured products. The increase for the last ten years, in all these lines, has been marvelous. The chief manufacturing cities are Paducah, Henderson, Owensboro, Louisville, Newport and Covington, all on the Ohio River. Louisville, at the falls of the Ohio, is rapidly becoming one of the most important manufacturing cities in the Union. Here are some of the largest plants in the world for the production of plug-tobacco, snuff, cigars, wagons, buggies, carriages, furniture and all kinds of farming implements. Manufacture of famous Kentucky whiskey is a large industry. The internal revenue from this source is over $20,000,000 annually.

Commerce. The commerce has increased nearly a hundredfold in the past decade. Besides horses, mules, cattle, sheep and swine, the leading articles of commerce are tobacco, flour and gristmill products, lumber of all kinds, liquors, iron and steel goods, leather, clothing, cars, cottonseed oil and dressed meats.

Transportation. The nearly 2,000 miles of river navigation and the 4,000 miles of railroads and electric car lines through the center of the state furnish ample means and facilities for travel and transportation of all kinds of freight. In addition to its railroads and electric lines the state has many thousands of miles of macadamized and gravel roads, all of which furnish easy, safe and rapid transportation for its various products.

Education. Kentucky has provided and is supporting a uniform system of public schools which are required to be taught six months in the year, and which all children between the ages of six and twenty years are entitled to attend. The state pays liberally for the support of these public schools, the *per capita* of 1911 being $4.40. There are about 9,000 elementary public schools. These are divided into eight grades, requiring from eight to ten years for their completion. The number of children reported in 1911 within the school age was 739,684. The same provision is made for the colored children as for the whites, but they must be taught in separate schools and by colored teachers. The state school fund in 1911 amounted to $3,500,000. This, in some of the counties and in nearly all the towns and cities, is supplemented by local taxation, so that their schools are taught from eight to ten months each year and their teachers receive higher salaries. The average salary of teachers in the rural districts is about $50 per month. Kentucky has two superior normal schools for the training of teachers, one located in Richmond, Madison County, in the east, and the other in Bowling Green, Warren County, in the west. The state also supports a university in Lexington, which is attended by nearly 1,000 students annually, and schools for the blind, deaf and dumb and the feeble-minded. A normal and industrial school for the negroes, located in Frankfort, is largely attended. Tuition is free, and the teachers, 17 in number, are paid by the state. Among the most noted of the colleges and universities are Kentucky University at Lexington, Georgetown College in Georgetown, Berea College at Berea, Bethel College in Russellville, Central University in Danville and Kentucky Wesleyan College in Winchester. Most of these are well-endowed, and do thorough and efficient work.

History. Kentucky originally was a part of Virginia, and was explored and settled principally by emigrants from Virginia and North Carolina. For many years it was the hunting-ground of the Indians north of the Ohio River and south of Tennessee. It took years of strife and bloodshed to win it from the Indians. It was admitted into the Union in 1792 — the fifteenth state. Kentuckians have acted a conspicuous part in national and state affairs, and in the War of 1812, the war with Mexico, the Civil War and the Spanish War her sons stood abreast of the soldiers and patriots of any other state. The population is 2,289,905, fifteen per cent. being negroes.

Ke'okuk (*kē'ō-kuk*), **Ia.,** is situated almost at the southeast extremity of the state on the Mississippi River (here crossed by a railroad bridge), 161 miles by rail southeast of Des Moines. Keokuk has six lines of railroad. The largest steamboats can always come up to Keokuk, and Des Moines Rapids, immediately above, are passed by a canal 7.6 miles long, which cost about $6,000,000. The town contains medical, dental, pharmaceutical and commercial colleges. One of the largest starch factories in the world is located here, and among its other industries are lumber and flour mills, foundries, stoveworks and readymade clothing. Other important establishments can fruits, make pickles and pack poultry. Manufacturing facilities have been increased by the building of the second longest dam (1¾ miles) in the world, which cost $10,000,000 and supplies 180,000 horsepower. Its chief buildings are the Y. M. C. A., Saint Joseph's Hospital, a public library, a Home for the Friendless and St. Vincent's Academy. The bones of Chief Keokuk of the Sac-Fox nation rest at Rand Park. Population 15,000.

Kep′ler, Johann, one of the greatest of astronomers, was born at Weilderstadt, Germany, Dec. 27, 1571. Kepler when young showed great aptness for learning, and in 1588 was sent to the University of Tübingen at the expense of the duke of Württemberg, to study for the ministry, but soon abandoned theology for mathematics and astronomy; and to astronomy, in spite of poverty, sickness and many other trials, his life was henceforth devoted. Copernicus had already established the fact that the planets revolve around the sun, but they were still supposed to move in circles, with no unity among them, except that the sun was their common center. After more than 20 years of study and investigation Kepler was able to announce the three laws of planetary motion, which formed the groundwork of Newton's discoveries and constituted the starting-point of modern physical astronomy. These laws are: (1) the planet's orbit is an *ellipse*, of which the sun is one focus; (2) as the planet describes its orbit, its radius vector traverses equal areas in equal times; and (3) the square of a planet's periodic time is proportional to the cube of its mean distance from the sun. Besides these immortal discoveries, the world is indebted to Kepler for discoveries in general physics and geometry. He died at Ratisbon, Nov. 15, 1630. See Brewster's *Lives of Galileo, Tycho Brahé* and *Kepler*.

JOHANN KEPLER

Kern, John Worth, was born at Alto, Ind., in 1849. He studied at Indiana Normal College and (1866–7) at the University of Michigan. He then studied law, and in 1869 was admitted to the bar at Kokomo, Ind. Next year he was elected city-attorney and reëlected five times. In 1884 he became reporter to the Indiana supreme court, removing to Indianapolis in 1889. During 1893–7 he served in the state senate. In 1900 and 1904 he was the Democratic candidate for governor, but was defeated. In July, 1908, he received the national Democratic nomination for the vice-presidency. In 1911 he was elected to the U. S. Senate.

JOHN WORTH KERN

Ker′shaw, Joseph Brevard, was born in South Carolina, Jan. 5, 1822, and at the breaking out of the Civil War he raised a regiment of volunteers, in command of which he took part in the first Bull Run battle. He afterwards commanded a brigade in a number of important engagements in the east, and in 1863 was transferred with Longstreets corps to the west. He was again transferred to the army of Virginia in 1864, and assigned to the command of a division with the rank of major-general. His division participated in the final campaign of General Lee's army, which resulted in the surrender at Appomattox Court House. He died at Camden, S. C., April 13, 1894.

Kew, a village in Surrey, England, on the right bank of the Thames River, famous for the royal botanic gardens that cover 75 acres In addition to numerous hothouses and conservatories, the principal features are a palm-house, 362 feet long, 100 feet wide and 66 feet high; a temperate house of the same height, occupying three fourths of an acre; and the pagoda, an octagonal ten-storied building, 163 feet high. Near the northern entrance is the old Kew palace, formerly a favorite residence of George III. The pleasure-grounds which surround the gardens contain over 200 acres. The observatory is chiefly used as a meteorological station. Population 2,699.

Kewanee (*kē-wä′nē*), a city in Henry County, Ill., about 122 miles southwest of Chicago. It is in a farming section and has coalfields in the near vicinity. It manufactures agricultural implements, steam-heating machinery, carriages, wagons and pumps, and besides has tube and boiler works employing more than 3,000 men. The city has good schools, a public library of 10,000 volumes and owns and operates its waterworks. Kewanee has the service of the C. B. and Q. Ry. Population 9,307.

Key, Francis Scott, author of *The Star-Spangled Banner*, was born in Frederick County, Md., Aug. 9, 1780. He was educated at St. John's College, Annapolis, and practiced law at Frederick City and Washington. During the British attack on Baltimore in September, 1814, and while detained on the British fleet during the bombardment of Fort McHenry, Key wrote his immortal lyric. The poet died at Baltimore, Md., Jan. 11, 1843.

Key West, Fla., a port of entry and county-seat of Monroe County, Florida, is situated on the island of Key West, 60 miles southwest of Cape Sable. It is a coral island, seven miles long and from two to three wide, and nowhere is more than 11 feet above the sea. There is a good harbor, defended by a casemated brick fort; and the buildings include a custom-house, barracks and a marine hospital. The Methodist Seminary and Holy Name Academy are the principal institutions of learning; the latter was used as a hospital for soldiers during the Spanish-American War. The streets are wide and straight, with street-car lines; most of the houses are built of wood. The exports are salt, turtles, sponges, fruits, vegetables and cigars, which are manufactured here in large quantities. The nearness of dangerous reefs has made the business of salvage of much importance, for although the government has erected two lighthouses in the harbor and others among the islands, every year sees numerous wrecks. The climate is warm and equable, and the place is a favorite resort of consumptives. Key West is connected by rail with the mainland 130 miles distant. Population 19,945. See FLORIDA KEYS.

Khartum (*kär'tōōm'*), the most important town in Egyptian Sudan, situated between the Blue and the White Nile, a short distance above their junction. Khartum is the starting-point and terminus of caravans for the interior, and for a long time was noted for its activity in the slave-trade. It has a melancholy interest from its heroic defense by General Gordon against the superior force of the Mahdi in 1884–85. Two days before the rescuing army reached the place, the city fell, and Gordon was among the slain. Khartum is in railway and telegraphic connection with Cairo, and since December, 1899, the Sudan has been open for traffic. Before the dervish revolt a considerable trade was carried on with Egypt, the exports being gold dust, ostrich feathers, gums, hides and skins. There is an English governor-general at Khartum.

Khedive (*kā'dēv'*), **The,** a Turkish name for a king or lord, has been the title of the modern viceroys of Egypt since 1867, when it was given by Sultan Abdul Aziz of Turkey to Ismail Pasha. The office was to be hereditary in the khedive's family The sultan, however, soon regretted the strength and influence which Ismail derived from the new title; and with British aid Ismail was deposed in 1879. Other khedives of the family of Ismail followed; but in 1882 a quarrel with Britain led to the bombardment of Alexandria and the occupation of Egypt by a British army. Since 1882 the khedive has been somewhat of a puppet in British hands, while a new era of prosperity has dawned for Egypt.

Khiva (*kē'vä*), a khanate of Turkestan in central Asia, now a Russian vassal state. It contains about 22,320 square miles, the surface being mostly a sandy desert, with many fertile tracts scattered over it. The population, half of which is Turcoman, is estimated at 800,000 Ever since the Russians entered central Asia there has been more or less strife and hostility between them and the Khivans. The khan has no power to make treaties with foreign powers without the sanction of Russia. The chief town is Khiva (population about 5,000). The products are chiefly silk and cotton See works by Burnaby and Landsell.

Khor'sabad'. See NINEVEH.

Khyber (*kī'bŭr*) **Pass,** the great northern military road between the Punjab and Afghanistan. This pass is a little over 30 miles in length and varies in width from 150 to 20 yards, although in one place it is only about 10 feet wide. Khyber Pass has been the key of the adjacent regions in either direction since the days of Alexander the Great. According to the terms of the treaty of Gandamak, made in 1879, the Anglo-Indian authorities are hereafter to have full control of this pass.

Kiauchau (*kē-ou'chou'*), a Chinese seaport in the province of Shantung, ceded to Germany on a 99 years' lease in January, 1898; area of the protectorate, exclusive of the bay, about 200 square miles, with a population inside the neutral zone of 33,000. It is used by Germany as a fortified dockyard and naval station.

Kick'apoo Indians, a tribe of the Algonquin family, found by French missionaries, toward the close of the 17th century, on Wisconsin River. They took an active part against the settlers during Pontiac's war in 1765. By the treaty of Greenville, on Aug. 3, 1795, they ceded a part of their lands, and a few years afterward made further cessions. Against the warning of General Harrison they joined Tecumseh in 1811, and fought in the battle of Tippecanoe. They are now settled in northeastern Kansas and in Oklhoma.

Kidd, Capt. William, was born about 1650 in Scotland, and is supposed to have been the son of a Covenanting minister. Kidd went early to sea, and highly distinguished himself in privateering against the French in the West Indies. In 1691 he received a reward of $750 from New York city for protecting the colony against pirates. In 1695 a company for the suppression of piracy was organized in England, and the command of the enterprise given to Kidd. In 1696 Kidd set sail for Madagascar, the rendezvous of the pirates. Very soon after, rumors reached England that Kidd was playing the game of pirate himself, and orders were issued to the governors of the English colonies to arrest him. After a two years' cruise he returned to the West Indies, and a few months later landed in Boston without securing a safe-conduct. He was arrested and sent to England to be tried for piracy and the murder of one of his men. He was found guilty and hanged at Execution Dock, London, May 24, 1701. Before coming to Boston Kidd buried a large treasure on Gardiner's island, off Long Island, which, with what was recovered elsewhere, amounted to $70,000. There for a long time was a popular belief that Kidd had buried other treasure along the coast, but, although frequent search was made for such, none was ever found.

Kiel (*kēl*), a seaport in Schleswig-Holstein, Prussia, with a fine harbor, the chief German naval station on the Baltic. The total tonnage, entered and cleared, of the port in one year was 1,170,334 tons. The University of Kiel in 1906 had 117 professors and 1,157 students. Population 163,172.

Kiev or **Kieff** (*kē'yĕf*), a city of European Russia, on the right bank of the Dnieper. It is connected by rail with Moscow and St. Petersburg, and a magnificent bridge spans the Dnieper. Kiev has a large university, founded in 1834 (with 2,326 students), besides other institutions of learning, of which the Greek theological academy is the most liberally endowed. From the 13th to the 17th century Kiev was a Polish city, but was reannexed to Russia in 1667. Population 320,000.

Kilauea (*kē-lou-ā'ā*), a volcano in Hawaii, one of the largest in the world. It is constantly active, and the crater is nearly eight miles in circumference.

Kil'imanja'ro, a name which means great mountain, lies close to the eastern coast of Africa, 175 miles from the equator. The mountain is volcanic, and rises about 19,700 feet, probably the greatest altitude in Africa. The mountain was first ascended, after many unsuccessful attempts, by Hans Meyer, the explorer, in 1889. Dr. Meyer found the higher of the two peaks into which the mountain forks to be crowned by a crater over one mile in diameter. This peak is known as the Kibo, the other as the Kimawensi. On the sides of the mountain is graded the vegetation of all climes. The verdure at the base is tropical; but as the explorer ascends, species after species of plant-life is left behind, until at 14,000 feet there is no more growth. Both summits are crowned with perpetual snow, a fact which scientists for many years refused to believe, owing to the nearness of the equator. Kilimanjaro is an isolated and conspicuous peak rising sheer from the plains.

Killar'ney, a small market town in Kerry County, Ireland, famous from the large number of tourists who visit the lakes near the town. These lakes, three in number, are situated in a basin in the midst of the mountains, some of which rise abruptly from the water's edge and are densely clothed with trees from base to summit. The scenery of Killarney is beautiful and in many respects unique.

Kil'ogram, the arbitrary standard of mass, made of platinum and preserved at the International Metric Bureau at Paris. One one thousandth part of this mass is the *gram*, which is the unit of mass employed in all scientific work. It was the intention to make the gram as nearly as possible equal to the mass of one cubic centimeter of water under standard conditions; but this does not affect the definition of the gram or of the kilogram. It is important to understand that the kilogram is a purely arbitrary unit. One kilogram = 2.2046213 lbs. Mass of one cubic decimeter of water at 4°C = 1.000013 kilograms.

Kil'patrick, Hugh Judson, a United States cavalry officer who won a brilliant reputation during the Civil War. He was born near Deckertown, N. J., Jan. 14, 1836; graduated at West Point and entered the army as second lieutenant of artillery on May 6, 1861. He was wounded at the battle of Big Bethel on June 10 of that year, and after his recovery was commissioned lieutenant-colonel of the 2d New York cavalry. After rendering important services in various campaigns in the eastern army, for which he was promoted to the rank of brigadier-general, in the spring of 1864 he was ordered on duty with General Sherman in the west; and during the Atlanta campaign and the campaign through South Carolina and North Carolina he rendered active and efficient service. He died at Valparaiso, Chile, Dec. 4, 1881.

Kim'berley, the capital of Griqualand West, now incorporated in Cape Colony, Africa, is the center of the diamond diggings There are four chief mines, Kimberley, Dutoitspan, De Beers and Bulfontein. On the outbreak of war with Transvaal (October, 1899) the place was invested by the Boers, and Cecil Rhodes, the capitalist, was shut up with a few British and Outlanders in the town. It was gallantly defended by Colonel Kekewich and a small garrison. After a siege of four months the place was relieved by a British force under General French on Feb. 15, 1900. Population 13,656.

Kin'dergar'ten. The kindergarten is a type of school for children from three to six years of age, too young to go to the graded school. The principles underlying the kindergarten really constitute a great reform movement in education, started about 1840 by Friedrich Froebel of Germany. Froebel conceived education as a development of one's latent powers through spontaneous self-activity rather than as a process of receiving information. He recognized that in his time the period most neglected was that between the ages of three to six when neither parents nor teachers ordinarily gave special attention to the child's development, and he therefore worked out and applied his principles in a course of training for pupils of that age. One of the surest proofs of the soundness of the kindergarten as conceived by Froebel is the fact that its general principles have gradually worked their way up into the grades of our best schools and are being applied there.

The starting point of kindergarten method is the nature of the child, essentially social and active both physically and mentally. Spontaneous outlet for these natural activities is found in the construction of objects calling forth the child's powers of creative imagination, in storytelling, in singing suitable songs, in organized games calling both for co-operation and individuality and similar social activities.

According to reports received from public-school teachers, children who have had kindergarten training are much better informed than other children, better at drawing, constructive and artistic work, quicker to learn, more imaginative, more enthusiastic, less self-conscious, more self-reliant, more helpful and thoughtful of others, more sociable and more sympathetic both to their teacher and their schoolmates.

In some places kindergartens have been severely criticized and their principles misunderstood owing to the fact that persons were accepted as kindergarten teachers who were not properly trained and neither understood true kindergarten principles nor how to apply them. It is essential to the success of the kindergarten that its teachers have adequate preparation for their work, and that in any city where kindergartens are established there be a competent and talented supervisor to see that kindergarten principles are applied intelligently and to give to young kindergartners whatever instruction and aid may be desirable. Otherwise there is danger of their degeneration into mere playschools.

Most of the kindergartens first established in the United States were private institutions. A few were endowed by philanthropists. The kindergarten was first tried as a part of our public-school system in St. Louis about 1873, owing to the influence of W. F. Harris, then superintendent of schools in that city, and kindergarten work is now becoming generally recognized as the first stage of public education.

Kin'eto-Pho'nograph, an instrument that is the result of several separate inventions of T. A. Edison. The kinetograph is directed to catch photographically the action of the players on a stage, while the phonograph at the same time records their words with the music or any other sounds accompanying the performance. The result is the reproduction of the action and the words of a play or any similar performance, the two being capable of exhibition together at any time afterward. The combined instrument capable of recording words and action simultaneously is one of the most ingenious ever constructed, and was finished by Edison and W. K. L. Dickinson in 1895.

Kinet'oscope, an invention of Edison's in 1894, by which the views taken by the kinetograph are exhibited upon a screen, causing the action of any scene to be reproduced continuously and in proper order and succession, precisely as it was enacted at some previous time.

King of the Golden River, The, is a fairy story told by the Englishman, John Ruskin, to a little girl friend of his, and afterwards published. Three brothers lived in a fertile valley, called Treasure Valley. The two older brothers were hard and cruel, and by their villainy they caused the winds to turn away the rain from the valley, till it became a desert. They did not then repent, but brought on themselves a terrible death in their attempt to secure the golden river. The youngest brother was kind and brave of heart, and gained the love of the King of the Golden River; who then found a way to break through the hills into Treasure Valley and bring fertility and happiness once more with the waters of his river.

King, Rufus, American statesman, was born at Scarborough, Me., Mar. 24, 1755, and graduated at Harvard College in 1777. In 1784 he was chosen a delegate to the Continental Congress. On the 25th of May, 1787, King took his seat in the convention for framing the constitution of the United States, and, although one of the youngest members, was one of the most active and influential. In 1796 he was appointed minister to England by President Washington, a position which he filled for eight years. King also served a number of terms in the United States senate. After the expiration of his fourth term in the senate, in 1825, he accepted the embassy to England, but resigned and returned home in the following year on account of ill-health. He died at Jamaica, Long Island, N. Y., April 29, 1827.

King, William Rufus, an American statesman who in 1852 was elected Democratic vice-president of the United States, was born in North Carolina in 1786, and died in 1853 in Alabama. King was a prime mover in securing the state constitution of Alabama, where he had settled as a cotton planter. In 1819 he was chosen one of the first Alabama senators for Congress. In 1844 he was minister to France, charged to persuade France not to join with England in protesting against the admission of Texas into the United States. In 1848 he was senator again, and in 1850 he was chosen unanimously as president of the senate. He died a few weeks after taking the oath of office as vice-president.

KINGBIRD

King'bird, one of the flycatchers of North America, is about eight and one half inches long, with the upper parts grayish black, the tip of the tail and under parts white. It also has a partly concealed orange-red patch on the crown. It catches insects while on the wing and is often called bee-martin and accused of killing many honey-bees. The examination of the contents of the stomach of a large number of these birds shows, however, that the mischief done in that direction has been greatly overestimated. They devour an immense number of injurious insects and relatively few honey-bees. They feed on beetles and cankerworms, as well as winged insects, and eat some berries. They are distributed generally in this country as far west as the Rockies, are common summer residents, migrate in May and September. They are usually seen in garden or orchard. Their nest is compactly built, made of grasses, weed-stalks and moss, lined with plant-down and other soft material. The three to five eggs are white marked with chocolate. The male shows great bravery in defending the eggs and nestlings from the attacks of the crow and other birds.

SPOTTED KINGFISHER

King'fisher, a well-known fishing-bird of world-wide distribution. It is more common in the Old World than in the New. Of the 180 known kinds, only eight are inhabitants of the New World and only one is found in the Eastern United States. This bird —the common belted kingfisher — is widely distributed, but is a familiar bird only where fishing is to be had. There it is a common summer resident, comes early, as soon as the ice has broken up, and stays late, sometimes all winter. It is a beautiful bird, but less brilliant than other members of the group. The upper parts are bluish-gray and the under parts whitish, with a bluish-gray belt on the breast, the bird being considerably larger than the robin. The head is crested, the bill long and dagger-like. It is a rapid flyer, but is sometimes seen perched on a post or dead tree near ponds and quiet rivers. It catches fish with dexterity in its strong bill. The kingfishers make nests in holes in the banks, and return year after year to the same place. There are numerous species of these birds, especially in the East Indies. The true kingfishers are closely related to the halcyons or wood kingfishers, famous in classical literature. There was an old fable to the effect that their nests floated on the water, and they were supposed to breed during the halcyon days —a period of 14 days— seven days preceding and seven days following the shortest day of the year. During these days, according to the old superstition, calm weather prevailed on the seas. See Blanchan: *Bird Neighbors.*

BELTED KINGFISHER

King Lear, a tragedy, was written by Shakespeare probably between 1603 and 1606. It is based on an ancient legend which had come down, probably, from the ancient Britons, and was told by Geoffrey of Monmouth about 1150 and by Layamon about 1200. Edmund Spenser, also, had touched on the story, and it had even been dramatized. But it is greatly transformed by Shakespeare's hand. The story is that of an old king, who, as he gets feeble, turns to his children for affection. But, because he has all his life been used to rule and to get things more by fear than for love, he demands this affection from his daughters and lets them know that whoever expresses her love most strongly will secure the best reward. He accepts as true the violent expressions of love that his two elder daughters offer; while he is enraged beyond measure by the constrained silence of his youngest child, Cordelia. He therefore divides his kingdom between the former, and proposes to live with them in turn; while Cordelia he turns away penniless. But the king of France, who was present, sees Cordelia's goodness and weds her. Then the elder daughters tire of the king who has no more to give, and, as his protests become troublesome, turn him out of doors into the storm. The French king then comes with Cordelia and an army to right King Lear. They find him broken in mind and body; but under the love of Cordelia he regains something of his reason. But the English defeat the French king, and capture Lear and Cordelia. The order is given that both be slain. But at this point one sister poisons the other, because both have fallen in love with the same man. This crime is discovered, and at the same time the intention of killing Lear and Cordelia is revealed. The order for their death is countermanded, but Cordelia has been slain; and the old king dies broken-hearted, his dead child in his arms.

King'lets are tiny, gray-green, active birds with brilliant spot on crown and with power of song out of all proportion to their size. The ruby-crowned kinglet is distributed throughout North America, breeds in the far north, and is seen chiefly in fall, winter and early spring. The call-note is thin, and gives no hint of the rich melody of the song. Though so tiny, the bird is not shy, seldom allows an intruder to interrupt it in its business of hunting for insects and larvæ, in which it seems constantly at work. It is considerably smaller than the English sparrow, olive-green above, light yellowish-gray below, wing-bars whitish. It builds in evergreen forests, its nest surprisingly large, woven of moss, plant-fiber, and strips of fiber and lined with soft, warm material. The golden-crowned kinglet seldom keeps still long enough to allow the observer opportunity to study it in detail. But two of our birds are smaller, the humming-bird and the winter-wren. Its range is North America generally. See Blanchan's *Bird Neighbors.*

RUBY-CROWNED KINGLET

SITKAN KINGLET

Kings'ley, Charles, an English clergyman and author, was born on June 12, 1819. He graduated at Cambridge in 1842 with high honors, and two years later became the rector of Eversley, in Hampshire, where he remained until his death. Kingsley attained a world-wide fame both as preacher and writer. He threw himself with the greatest zeal and energy into various schemes for the improvement of the English working-classes, and in 1849 published two novels, *Alton Locke* and *Yeast,* both of which dealt with modern social questions in a bold and original manner. The influence of these books at the time of their publication was a great one, and caused the name of Christian Socialist to be applied to Kingsley. In 1853 he published *Hypatia,* a brilliant picture of Christianity in the fifth century in conflict with Greek philosophy. *Hereward the Wake,* which appeared in 1866, was his last novel. His other important works include the novels *Westward Ho* and *Two Years Ago,* and the charming fairy tale, *The Water Babies,* together with a volume of poems and one embracing *Prose Idylls.* His death occurred on Jan. 23, 1875. See his *Life* by his widow.

King's Mountain, a range in North Carolina, some 16 miles in length, the southern extremity of which is in York County, South Carolina. Near this southern extremity British soldiers under Lieutenant-Colonel Ferguson were attacked by American militia under the command of Colonel Benjamin Cleaveland on Oct. 7, 1780, and after a desperate resistance were nearly all taken prisoners. This victory contributed in no small measure to the final success of the Revolutionary army.

King'ston, Rt. Hon. Charles Cameron, P. C., premier and attorney-general of South Australia and minister of trade and commerce in the Barton cabinet (Australian commonwealth), was born at Adelaide, South Australia, in 1850. He is an advanced Liberal in politics, and has represented West Adelaide in the local assembly since 1881, and has repeatedly held office. In 1897–98 he was president of the national Australasian federal convention which sat successively at Adelaide, Sydney and Melbourne and framed the bill to establish the Australian commonwealth.

Kingston, a city of Ontario, Canada (population 19,000), is situated at the head of the Thousand Islands of the St. Lawrence River. Lake and river steamships call daily. The Grand Trunk and Canadian Pacific Railways reach it. Historically the city is of great interest, since it shared the earliest settlement of the province. Count Frontenac's guard 234 years ago watched over his camp where the city now stands. This historic ground is part of La Salle's seigneury which was granted to him by the king of France. He built a fort near by, which stood the ravages of time from 1677 to 1820. Kingston is closely associated with the history of the great explorer. Fort Frontenac was built to secure the traffic for French merchants and make it easy to extend New France westwards. In 1751 the first armed vessel on Lake Ontario was built at Fort Frontenac. The dream of La Salle was never realized. In 1841 Lord Sydenham selected Kingston as the capital of the united provinces of upper and lower Canada. He opened the first Parliament of united Canada in that year in Kingston. Kingston held the honor of being the capital city for three years only. In the manufacture of locomotives, cars, steam engines and agricultural implements

Kingston holds a high place. Its educational advantages are excellent. Queens University and Kingston School of Mining are institutions of first importance. The university prospered greatly under the presidency of the Reverend George M. Grant, and that prosperity continues under the guidance of President Gordon, D. D. Queens has given many prominent men to Canada.

Kingston, the commercial and political capital of the island of Jamaica, stands on the northern side of one of the best harbors in the world. It was founded in 1693–1703 after the town of Port Royal, six miles distant, had been destroyed by an earthquake. Kingston suffered from a severe earthquake Jan. 14, 1907, which destroyed 1,100 lives, 6,000 buildings and caused a property loss of $25,000,000. Population about 50,000.

Kingston, N. Y., county-seat of Ulster County, stands on the right bank of the Hudson, 54 miles south of Albany and 88 north of New York. It is a railroad and canal terminus, and is the center of an extensive transit trade by steamer. Beside being the terminus of the Ontario and Western, Ulster and Delaware and Wallkill Valley railroads, Kingston may be reached by the West Shore or by the N. Y. C. and H. R. railroad. Enormous quantities of bluestone "flag" are forwarded from Kingston, which also is the center of the hydraulic cement business, and contains breweries, foundries, brickyards, cigar-factories, shirt-factories and other manufactories. Population 25,908.

Kio'to or **Kyoto** is a city of Japan on the island of Hondo or Honshu. It is an inland city, and owes its present importance chiefly to the large number of religious shrines it contains, to the many forms of art that are produced there in the highest excellence and to the Imperial University. In 1908 its population was 442,462, and it is increasing in size. From 794 to 1868 it was the capital of Japan, losing this distinction with the fall of the shogunate and the rise of new Japan.

Kip'ling, Rudyard, an author of wide celebrity, was born at Bombay, India, in 1865, his father being in the English civil service. He was educated in England and, returning to India, became assistant-editor of the *Lahore Gazette*, and later filled a like post on the Allahabad *Pioneer*, to both of which he contributed many of his interesting sketches of Anglo-Indian life. His *Plain Tales from the Hills* (1888), followed by *Soldiers Three, The Seven Seas, Barrack-Room Ballads, The Light that Failed, Departmental Ditties, Captains Courageous, Phantom Rickshaw, Under the Deodars* and *In Black and White*, made him known as a writer of masterly short stories and brilliant verse. He married an American, Miss Balestier, of Brattleboro, Vt., where he lived for a time. He has since traveled extensively in China and Japan, in South Africa and in Australasia, and on his return from the scenes of the Boer war he resumed his residence in England, at Rottingdean, near Brighton. His writings grow apace, and are received with increasing favor by those who recognize his versatile genius. Especially is he admired throughout the British empire by those who value his militant patriotism, and see in him the uncrowned laureate of the empire. In his *Recessional* and *McAndrew's Hymn* Kipling touched a deeper note than in his novels, as also in some of his other poems and more thoughtful verse. Among his recent notable works are *The Day's Work, Kim, The Jungle Books, Wee Willie Winkie* and *Puck of Pook's Hill.*

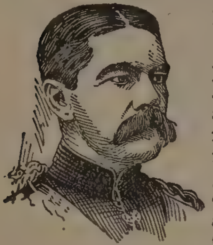
RUDYARD KIPLING

Kirchhoff (*kĭrk'hŏf*), **Gustav Robert,** a distinguished German mathematical physicist, was born at Königsberg, Prussia, in 1824. He began teaching at Berlin in 1848, but in 1850 was called to Breslau to an extraordinary professorship. In 1854 he accepted the professorship of physics at the University of Heidelberg, where, in 1859, in conjunction with Bunsen (*q. v.*) he published his epoch-making paper on spectrum analysis. Besides this, his most important work, perhaps, is his determination of resistance in absolute measure, his discovery of the laws governing the distribution of electric currents in a network of conductors and his mathematical papers on elasticity and optics. In 1870 he was called to Berlin. He died at Berlin, Oct. 17, 1887. See *Life* by Boltzmann.

Kirkpatrick, Sir George Airey, was born in Kingston, of Irish parentage, in 1841. He graduated from Trinity College, Dublin. At one time he was president of the Canada Locomotive Works and the Dominion Rifle Association. He was first elected to the House of Commons in 1872, was re-elected several times, and was elected speaker in 1883. Later he was appointed lieutenant-governor of Ontario, and his term was extended because of his acceptable services. He died in 1889.

Kitch'ener, Lord Horatio Herbert, an English soldier, was born in 1850, educated at the Royal Military Academy at Woolwich, and entered the British army (the Royal Engineers) in 1871. In 1882 he served as major of cavalry in the Egyptian army, was with the Nile expedition in 1884, and was made governor of Suakim in 1886. For service in Sudan campaigns he was made

Companion of the Bath. In 1888 he was made adjutant-general in the khedival or Egyptian army, and held that position until 1892. In the latter part of that year he was appointed *sirdar*. He commanded at the taking of Dongola in 1896, and was then made K. C. B. In August, 1898, he was in command of an English and Egyptian army near Omdurman, opposite the site of Khartum. Opposed was a force of dervishes numbering about 50,000, Kitchener's force being about half that number. This dervish army opened the attack on Sept. 2, 1898, and the defeat resulting was among the most remarkable in modern history. For this victory the general was given a peerage as Baron Kitchener of Khartum and Aspall. He rendered conspicuous service in the Boer War. Since 1902 he has been commander-in-chief of the British forces in India. See Stevens' *With Kitchener to Khartum*.


HORATIO H. KITCHENER.

Kite, a bird of prey, a member of the same family as the hawk and eagle. The swallow-tailed kite appears to spend all its waking hours in flight or sailing in the air; it feeds, drinks, woos and, it is thought, sleeps while in motion. No bird that soars is more graceful, its flight being so easy as to appear mere floating. Whether rising, diving, wheeling or skimming low above the surface, every movement is sure and beautiful. The bird is seldom seen walking, for its legs are short and scarcely visible. It is about 24 inches long, its spread of wings four feet, its plumage glossy black, the head, neck, under part and band low on back snowy white, tail long and cleft like a swallow's. It usually winters south of the United States, comes north in April and returns south in October. It is more common in the western gulf states and the region north of our great plains. It feeds largely on snakes, lizards, grasshoppers, locusts and crickets.

Kites. Kites until very recent times were a toy used exclusively by children, and were of two or three easily-constructed conventional forms. Since 1880 many attempts have been made to use them for scientific and advertising purposes, and under repeated experiments the forms have changed. One of these newer forms consists of an oblong box, open at both ends, constructed of light material and raised by the suction of the wind. Several differing forms have been invented during recent years, besides that above mentioned. The incentive is not amusement, but a desire to use kites of strong lifting power to carry instruments into the upper strata of the air for scientific observation and record and for making photographs.

Kla'maths, Indians living on the Klamath lakes in California and southern Oregon. In connection with the Modocs, Shastas, Cahwes, Hoopahs, Wallies, Tolewahs and other tribes, they often are called Digger Indians; but the Klamaths proper are far superior to the tribes with which they are often classified. In 1864 they ceded all their lands to the United States, except about 1,200 square miles, where they engage in agriculture and lumbering.

Klon'dike, the name first of a river and later of a gold-mining region in Yukon Territory, northwestern Canada. The name became suddenly famous in the autumn of 1897, because of the discovery of very rich placer gold-diggings earlier in that year by Geo. McCormick with a companion named Henderson. Great excitement followed this new discovery, many thousands of persons going to the region during the spring of 1897 and later. Since that date excitement has subsided, but the gold-fields have been indefinitely extended in various directions in the Klondike and in Alaska by new discoveries. The gold is found in frozen gravel-beds, which are covered with muck to a depth of from 10 to 25 feet, and all frozen solid. The work of the mines is thus very difficult and laborious. The chief city is Dawson, on the Yukon, north of the mouth of the Klondike, which has a population of 30,000. Yukon Territory has an area of close upon 200,000 square miles.

Klop'stock, Friedrich Gottlieb, a German poet, was born July 2, 1724, at Quedlinburg. Having read Vergil's *Æneid* and Milton's *Paradise Lost*, he resolved, when quite young, to write a German epic poem, selecting *The Messiah* as his theme. The first three cantos of this poem appeared in the year 1748. They attracted great attention, and caused Klopstock to be regarded as a religious poet of the highest order. The remaining cantos were published at Halle in 1773. Odes, tragedies and biblical dramas, with some hymns, constitute the remainder of his works. He died at Hamburg, March 14, 1803. See *Life* by Muncker.

Knight'hood. Our word *knight* is derived from the Anglo-Saxon word *cniht*, which first meant a boy or youth and afterward a servant or attendant. It was at length restricted to the military attendants upon nobles and officers of state. Under the feudal system, this relation was made binding and permanent by the relation of tenancy in which the knight held land on the condition of rendering service to his superior whenever called upon. Knighthood as a feudal institution was established in England by the Norman kings. The whole system of knighthood was abolished in the reign of Charles II. The history of knighthood, as a voluntary institution, began with the crusades. During these wars for the recovery of the Holy Land, the younger sons of many families enlisted under the banners of wealthy nobles; and it was not long until knighthood, won by military service, was esteemed more honorable than that which attached to the holding of land. The age of knighthood or chivalry may be said to have extended from the time of the crusades to the end of the Wars of the Roses, a period of nearly 400 years. Although knighthood originally was a purely military distinction in the 10th century, it came to be conferred on civilians as a reward for valuable services rendered to the crown or to the state. The first civil knight in England was Sir William Walworth, who won his title by slaying Wat Tyler in the presence of King Richard II in 1381. Since the abolition of knight-service, knighthood has been conferred as a mark of the sovereign's esteem, and in recent times it has been conferred as often on civil officers, scholars, lawyers, physicians and artists as on soldiers. See Grose's *Military Antiquities;* Nicolas' *British Orders of Knighthood;* and Hallam's *The Middle Ages.*

Knights of Labor. See LABOR ORGANIZATIONS.

Knights of Rhodes. See MALTA, KNIGHTS OF.

Knights of St. John. See MALTA, KNIGHTS OF.

Knights Templars. See TEMPLARS.

Knitting-Machines were invented in their simplest form, known as the stocking-frame, as early as the 16th century, by Lee of Nottingham, England. All knitting-machines were worked by hand until the 19th century. During the 19th century, however, over 2,000 patents in knitting-machinery were taken out in the United States alone. There are about 100,000 knitting-machines in use in the United States, most of them being circular and each having a series of needles arranged vertically and parallel to one another, inside a vertical cylinder which raises and lowers them with great rapidity. Knitting-machines are adapted to cotton and even silk fabrics as well as woolens.

Knox College, located at Galesburg, Ill., is one of the oldest institutions in the central west, having been chartered in 1837. It is co-educational, and has a faculty of 32 and an attendance of 560 students, exclusive of the academy and the conservatory of music. The college has productive funds to the amount, so far, of $300,000 and an income of close upon $50,000. It has a library of about 9,000 volumes.

Knox College of Toronto, Canada, was founded by the (Free) Presbyterian Church of Canada in 1844. The Rev. Dr. Burns took a leading part. The Rev. Michael Willis, a man of great learning, was its first principal. He filled the chair of systematic theology from 1847 to 1870. The college for 20 years occupied premises in which Lord Elgin governor-general of Canada, had resided. For some years there existed an arts department. The majority of students take the complete arts course in the University of Toronto. In 1885 the college was affiliated with the university, and it was federated with it under the federation act of 1890, thereby being constituted an integral portion of the University of Toronto. The college has 750 graduates. The endowments amount to $300,000.

Knox, Henry, an American soldier who highly distinguished himself during the Revolutionary War, was born at Boston, July 25, 1750. He received a good common-school education, and gave considerable attention to military tactics during his boyhood. He participated in the battle of Bunker Hill as a volunteer aid to General Ward, secretly making his way out of Boston for that purpose. During the siege of Boston he attracted Washington's attention by his skill in fortification. He took part in the battles of Trenton and Princeton, and was soon after chosen by Congress as brigadier-general of artillery, in which capacity he served with honor and distinction till the close of the war. General Knox stood high in Washington's confidence, and after the surrender of Cornwallis at Yorktown he was made major-general and placed in command at West Point. When Washington became president, Knox was appointed secretary of war, a position in which he exhibited the same faithfulness and efficiency he had always exhibited as a soldier. He died at Thomaston, Me., where he had a large landed estate, on Oct. 25, 1806.

Knox, John, the great Scottish preacher and reformer, was born at Giffordgate, a suburb of Haddington, on Nov. 24, 1505. He received his early education at the grammar-school of his native town, and in 1522 was sent to the University of Glasgow, but left without taking the degree of master of arts. Knox became acquainted with George Wishart, who had lately returned from travel in England and Germany with an ardent zeal to gain Scotland to the reformation. From this time Knox devoted himself with an earnestness and intensity never surpassed to establishing in Scotland what he deemed a church based on the teachings of Christ and his apostles.

In 1546 he preached to the Protestants who, after the assassination of Cardinal Beaton, had taken refuge in the castle of St. Andrew, and on the surrender of the castle, Knox, who had no part in the assassination, was sent, with others, a prisoner on board the French galleys. For nearly two years Knox remained a captive, but in February, 1549, at the solicitation of Edward VI, he was set at liberty. As it was unsafe to return to Scotland, he remained in England for four years, and on the accession of Mary in 1543 he had to seek refuge on the continent; but in September, 1555, he ventured into Scotland, where he remained until August, 1556, after which he returned to Geneva and preached there during the two following years. In May, 1559, Knox returned to Scotland, where he continued to be the life and soul of the reforming party until his death. The arrival of the young queen, Mary, in 1561 revived all the old dissensions. Mary's opinions on religious and political questions directly opposed those held by Knox and the party he represented, and all interviews and discussions between the young queen and the ardent reformer only widened the breach between them. At the coronation of the infant James VI in 1567 and at the opening of Parliament Knox preached in that strain which gave his sermons the force and character of public manifestoes. He made his last public appearance at the induction of his successor in St. Giles Cathedral, Edinburgh, in November, 1572, and died a few days later. Carlyle says of Knox: "A most clear-cut, hardy, distinct and effective man, fearing God without any other fear. There is in Knox throughout the spirit of an old Hebrew prophet — a spirit almost altogether unique among modern men. He is a heaven-inspired seer and heroic leader of men." See McCrie's *Life of Knox* and Thomas Carlyle's *Heroes and Hero-Worship*.

Knox, Philander Chase, was born in Brownsville, Fayette County, Penna., May 6, 1853. After attending the University of Virginia, he graduated from Mount Union College of Alliance, Ohio, in 1872. He was admitted to the Pennsylvania bar in 1875 and was the same year appointed district-attorney for the western district. He resigned next year, and later became celebrated as a lawyer in the service of the great corporations. He was appointed attorney-general of the United States by President McKinley on April 9, 1901. On McKinley's death he continued to serve under President Roosevelt, and prosecuted the celebrated suit to dissolve the Northern Securities Company in 1903. He resigned in 1904.

Knox'ville, a city of Tennessee in Knox County, is one of the oldest cities in the state and was the first capital. It stands amid picturesque scenery on Tennessee River, at the head of steamboat navigation, 165 miles east of Nashville. The city is served by the Southern Railroad and the Louisville and Nashville, and is the distributing point for the products of the surrounding fertile section. Among its industries those of greatest importance are woolen and cotton factories, flourmills and marbleworks, while it also manufactures coffins and caskets, furniture, desks, cabinet mantels, ready-made clothing, iron fencing and boilers. Here are the state's university, the agricultural college, the state school for deaf mutes, an industrial school for colored pupils, Knoxville College (United Presbyterian) and a handsome postoffice of marble. Knoxville figured prominently in the Civil War, being assaulted and besieged by Longstreet, while the city for a time was occupied by 12,000 Federal troops under General Burnside. Population 36,346, a gain of about 4,000 in the past decade.

Kobe (*kō'bȧ*) is a town in Japan lying only one hour by rail from Osaka, being continuous with the city of Hiogo, of which it, as it were, forms the European and trading section. Kobe has a larger volume of shipping trade than any other port of Japan, 75 per cent. of the vessels which enter being British. Hiogo and Kobe together have a population of over 250,000; and this is rapidly growing in numbers, owing to the lead taken by Kobe in trade at the expense of the older ports of Nagasaki and Yokohama.

Koch, Dr. Robert, a distinguished German physician and student of bacteria in their relation to diseases. He is widely known for his investigations on the disease germs of consumption and cholera. He was born at Klausthal, Hannover, in 1843, and took his M. D. from Göttingen in 1866. In 1882 he announced the discovery of the disease germ (*Bacillus tuberculosis*) which produces tuberculosis or consumption of the lungs. The following year he was sent by his government to Egypt and India to study into the cause and prevention of cholera. While in Calcutta, he discovered the comma bacillus, which is the disease germ of cholera. In 1890 he proposed the injection of a lymph into the body to combat the germs of tuberculosis, and great hopes were entertained for this method of treatment. Several years are required to complete the treatment, and it has not been successful. Dr. Koch is on the medical faculty of the University of Berlin, and engaged in the Institute of Hygiene.

Kohinur (*kō'ĭ-nŏŏr'*), a very valuable diamond which was in the possession of monarchs of India for centuries, and was owned by the late Queen Victoria. It is called the mountain of light, and is worth about $600,000.

Kohl'rausch, Friedrich, an eminent German physicist, son of Rudolf Kohlrausch, also distinguished as a physicist. He was born in 1840 at Rinteln in Germany, and is now director of the National Physical Laboratory at Charlottenburg. He was educated at the Universities of Marburg, Erlangen and Göttingen. He taught successively at Göttingen, Zürich, Darmstadt, Würzburg and Strassburg. In 1894 he succeeded Helmholtz as director of the Laboratory. His most important work is that which he did upon the electrical conductivity of liquids. His laboratory manual of physics, which has been translated into four different languages, has exercised a marked influence on the laboratory method of teaching physics on both sides of the Atlantic.

Ko'komo, Ind., the capital of Howard County, an important railway center on Wildcat River in central Indiana, 54 miles north of Indianapolis. Three railroad lines and three interurban lines traverse the city and the county, which is a productive one in an agricultural sense and largely devoted to stockraising and lumbering. The region is productive also of natural gas. It has thriving industries and manufactures and good educational institutions, churches and public buildings. Population 17,010.

Kolt'sof=Masal'ski, Princess, was a celebrated Rumanian writer. She was born at Bucharest in 1828, her maiden-name being Helen Ghike, and became a student of literature and language. When 15 she translated the *Iliad* into German. She traveled extensively throughout Europe from 1841 to 1848, and on her return married the Russian Prince Koltsof-Masalski and went to Russia to live, later to Italy and Switzerland. She became well known through her articles in magazines, and published a number of works. Her pen-name was Dora d'Istria. In 1867 the Greek legislature adopted her as a Greek citizen; and she was made a member of learned societies in Europe. She died at Florence on Nov. 17, 1888. Her principal works are *Monastic Life in the Oriental Church*, *The Heroes of Rumania*, *Women in the Orient*, *On Women by a Woman*.

Komura, Baron Jutaro, was born in 1854 in the province of Hiuja, a *samurai*. When 16 years old he met Dr. Griffis and other American teachers, with whom he studied during the next four years. He came to America at the time of the Centennial Exposition (1876), and stayed to study at Harvard, of which he is the first Japanese graduate. He saw diplomatic service in Korea in 1895, was then appointed Japanese minister at St. Petersburg and later at Washington, where he remained till 1900. He then served as minister at Pekin during the Boxer rebellion, and conducted the Japanese negotiations during the conference of the powers at Pekin, with credit to himself and his country. In 1901 he was appointed foreign minister, and had charge of the difficult negotiations with Russia concerning the evacuation of Manchuria. In 1902 he was made a baron. When President Roosevelt prevailed on the Japanese and Russians to meet at Portsmouth, N. H., it was Komura that the Japanese matched against De Witte, the Russian diplomatist. Komura was largely responsible, it is believed, for the peaceful outcome of the conference and the many real advantages the Japanese secured by the peace of Portsmouth. In person Komura is small and slight. His manner is reserved and gentle.

Kong Mountains, a range of mountainous uplands in western Africa, commencing 200 miles from the Gulf of Guinea. The height is less than a mile, and little is known about them. The people inhabiting the district are Mohammedans; the town of Kong is noted for its manufacture of cotton cloth.

Kongo. See CONGO.

Königgratz (*kẽ'nĭg-grâts'*), a town on the Elbe, 75 miles from Prague. A signal victory was gained here by the Prussians over the Austrians on July 3, 1866. The Austrians named the battle *Sadowa*, from an adjoining village near the battlefield.

Königsberg (*kẽ'nĭgs-bĕrg*), a city in eastern Prussia, is situated on both sides of Pregel River, 360 miles from Berlin. In the castle's chapel (built in 1592) Frederick I had himself crowned king of Prussia and William I was crowned in 1861. The university at Königsberg was founded as a Lutheran institution in 1544 and rebuilt in 1844–65. In 1907 the students numbered 1,080 and official teachers 148. Königsberg was first fortified in 1626, and was made a modern fortress of the first class in 1843 and the following years. Kant the philosopher taught in the university for nearly 50 years. Population 245,853.

Koordistan (*kōōr'dĭs-tän'*) or **Kurdistan,** a region of western Persia and eastern Turkey, adjacent to Armenia, comprising nearly 50,000 square miles. The number of inhabitants is estimated at 3,000,000, most of whom are Kurds. Although orthodox Mohammedans in religion, the Kurds have a different language from the Turks, and they differ from the heterodox Persians in religion; thus they are in a state of chronic warfare with the powers. They have the reputation of being wild and lawless and inclined to rob and plunder whenever they have the opportunity; but they are not generally either fanatical or cruel. They are naturally brave and hospitable, and possess crude feelings of honor.

Koot'enay, Kootenai or **Cootenai.** The name of a tribe of American Indians. They numbered about 1,000 in 1890, and are remarkable as having a language indicating a distinct stock among the aboriginal tribes of the United States. These Indians are now found mainly in British Columbia, although there also are small numbers of them living in Washington, Idaho and Montana. They are peaceful, and engage in rude agriculture as well as hunting and fishing. A portion are Christians nominally, while the remainder are sun-worshipers. An account of the ethnology, mythology, physical characteristics and language of the Kootenays, by A. F. Chamberlain, will be found in the report of the British Association for 1892.

Kootenay District or **The Kootenay** forms the southeastern portion of British Columbia west of the summit of the Rocky Mountains, and is drained by Columbia and Kootenay Rivers. Eastern Kootenay contains a large extent of agricultural land, much of which requires irrigation, but is suited to fruitgrowing and all kinds of grain and vegetables. Most of the land is well-timbered and lumbering, next to mining, is the principal industry There are considerable areas of fertile land in western Kootenay, a good deal of which is utilized for fruit-growing. The fame of the Kootenay mines is world-wide, the mountains being rich in gold, silver, copper and lead, and the eastern valleys are underlaid with coal and petroleum. British Columbia mining has reached its highest development in Kootenay, and as a consequence many prosperous cities and towns have been established. The development of the Crow's Nest coalfields and the revival in metalliferous mining caused a rapid increase in population, especially in eastern Kootenay, where it is estimated to have more than doubled since 1901.

Koran (*kō'ran* or *kō-rän'*), the sacred book of Mohammed and the foundation of Mohammedan literature. The word is derived from the Arabic *karaa,* to read, so that Koran means the Reading or the book to be read. It is divided into 114 suras or chapters, each of which bears a title indicating the nature of its contents, though occasionally the title is merely some word which occurs in the chapter. The Koran was dictated to Mohammed at different times during 23 years at Mecca and at Medina, either by the angel Gabriel in human shape, "with the sound of bells," or by God himself, veiled and unveiled, "in waking or in dreams of the night " The original fragments were written without any special order or arrangement, and many have been entirely lost. A year after Mohammed's death the scattered portions were collected by the prophet's scribe and copied without any attempt to reduce them to order or sequence, with all the variations, repetitions and gaps. This volume was intrusted to the keeping of Hafza, the daughter of Omar and one of the prophet's wives In the 30th year of the Hegira (A. D. 650), Caliph Othman ordered new copies to be made from the original fragments, and all the old copies were burned.

The chief doctrines laid down in the Koran are that there are one God, one true religion and a day of judgment. When mankind at different times forsook the path of truth, God sent prophets — Moses, Jesus and Mohammed being the principal ones — to lead them back into the right way. The doctrine of the divine sovereignty is carried almost to the verge of fatalism, and submission to the will of Allah is emphasized as the highest virtue of which man is capable Mohammedans everywhere hold the Koran in the highest reverence. It is never held below the girdle, never touched without previous purification, an injunction to that effect being generally found on the cover. It is consulted on all weighty and important questions, and nothing is more hateful in the eyes of a Moslem than to see the book in the hands of an unbeliever.

Kordofan'. See Egypt and Sudan.

Kore'a, known also as Chosen (Dawn-Land) and The Hermit Nation, once an Asiatic empire, is chiefly situated on a peninsula lying between the Yellow Sea and the Sea of Japan. It is separated from the Japanese islands by the Strait of Korea. The eastern coast is high, while the southern and western shores are low, with many inlets and islands. Port Lazaref is a fine harbor, which the Russians would have liked to get possession of. Until 1894 China was the suzerain of Korea, but, as the result of the war between China and Japan, the latter stepped into China's rôle, though the country was nominally independent. Russia was keen to get control; but the Japanese fought the great Muscovite power (1904–5) and did not permit her to get possession of the country. Foreign commerce was carried on through the three treaty ports of Chemulpo, Fusan and Yuensan, the bulk of the trade being with Japan. Its chief products, besides ginseng and rice, are millet, cotton, hemp and tobacco. Korea is quite mountainous. It is in the same latitude as Italy, and, like it, is shut in on the north by mountains; while a chain crosses the country from north to south. Its largest river is the Yalu or Am-nok. Iron, copper and gold are found; grass-woven mats, paper and silk are manufactured; and most of the trade is with Japan. Coin has just come into use, taking the place of gold-dust and silk, which were always used in barter. Most of the houses are mud huts thatched with straw. Korea until lately was a closed country. Japan first secured a treaty with Korea in 1876. Treaties were made with China and the United States in 1882, with Germany and Great Britain in 1883 and later with other nations, and three ports were opened to foreign commerce. There are over 600 miles of railway and 2,170 of telegraph. Conflicting claims to regulate affairs in Korea led to war between Japan and China in 1894. Since 1904 it has become a dependency of Japan. Christian missions have had wonderful success. The capital, Seoul, has a population of 278,958. Korea's is estimated at 13,125,027; its area at 86,000 square miles.

Kosciusko (*kŏs-sĭ-ŭs'kō*), **Thaddeus,** a Polish general and patriot, was born in Lithuania, Feb 12, 1746. He chose the profession of arms at an early age, and received his military training in France. On his return to Poland he received a captain's commission; but in 1777 he came to America and participated in the Revolutionary War, in which he rose to the rank of brigadier-general. When Russia assailed Poland in 1792, Kosciusko held a position at Dubienka for five days with only 4,000 men against 18,000 Russians, and after King Stanislaus surrendered to Empress Catherine he retired to Leipsic. At the rising of 1794, Kosciusko was appointed dictator and commander-in-chief. His defeat of a greatly superior force of Russians at Raclawice was followed by a rising of the Poles in Warsaw. He established a provisional government and took the field against the Prussians; but, as their force was three times as large, he was defeated and fell back to Warsaw, which he successfully defended against the Prussian and the Russian forces, and compelled them to raise the siege. But, finding that two additional Russian armies were marching against him, he reorganized his army and went out to check their progress. Being overwhelmed by superior numbers, he was defeated and taken prisoner at the battle of Maciejowice on Oct. 10, 1794. He was kept in rigorous confinement in St. Petersburg till the death of Empress Catherine two years later, when Emperor Paul restored him to liberty with many marks of esteem. Being offered a sword by Paul, he replied: "I have no need of a sword; I have no country to defend." In 1797 Kosciusko again visited the United States, where he was received with high honor and distinction on account of the services he had rendered in the War of Independence; and a grant of land was obtained from Congress in addition to the annual pension previously allowed him. The remainder of his life was spent in France and in Switzerland, where he gave himself mainly to agricultural pursuits. He was killed at Solothurn, Switzerland, Oct. 17, 1817, by the fall of his horse over a precipice. See biographies by Michelet and by Falkenstein

LOUIS KOSSUTH

Kossuth (*kosh'ŏŏt* or *kŏs-sōōth'*), **Louis,** a distinguished Hungarian patriot, was born at Monok in Hungary, on April 27, 1802. He studied law at Sarospatok, and commenced his political career at the Diet of Presburg in 1832 as the proxy of a member and as editor of a journal. He afterwards published a lithographed paper, which led in May, 1837, to his receiving a sentence of four years' imprisonment. He was liberated in 1840, and became editor of the *Pesti Hirlap*, in which he advocated the most liberal views and obtained a strong hold on the young men of the country. In 1847 Kossuth was sent to the Diet, and soon became leader of the opposition. He advocated the freedom of the press and the abolition of all feudal privileges, and after the Revolution of 1848 in France he demanded an independent government for Hungary. (See AUSTRIA.) In April, 1849, he induced the national assembly to declare that the Hapsburg dynasty had forfeited the throne, and was appointed provisional governor. Kossuth made a desperate effort to secure independence; but his struggles were in vain; and after the defeat of Temesvan he resigned in favor of Gorgei, who two days later surrendered to the Russians. Kossuth was then compelled to flee into Turkey. Austria and Russia both demanded his extradition, but the Porte refused to comply, and in 1857 he was liberated through the influence of England and the United States. In America and England he was received with every mark of sympathy and respect. In 1851-52 he once more visited the United States, and was greeted with unbounded enthusiasm. He addressed large assemblages in behalf of Hungarian independence; but his eloquence brought no substantial result, in spite of the general sympathy for himself and his cause. He returned to England in 1852, where he remained most of the time till 1859, when the war between France and Austria revived his dream of Hungarian independence; but all his hopes were disappointed when peace was concluded between the two empires at Villafranca. When Déak affected the reconciliation of Hungary with the dynasty (1867), Kossuth refused to avail himself of the general amnesty or to return to his native land to take the oath of allegiance. From that time he resided in Turin, Italy, where he died on March 20, 1894.

Krakato'a, a volcanic island in the Strait of Sunda, is remarkable for a terrific explosion on Aug. 27, 1883, when a large part of the island was blown away, destroying 163 villages and killing more than 36,000 people. This explosion is exceedingly interesting from a scientific point of view, since the dust which was carried many miles up into the atmosphere was later transported over the entire earth and produced remarkable red sunsets for many months. Not only so, but the atmospheric wave thus started was traced around the earth, by means of the barometer, during 3½ round trips to the antipodes and back. Sound waves were heard at the incredible distance of 2,000 miles. See *Report of the Krakatoa Committee of the Royal Society.*

Kreut'zer Sona'ta is the title by which Beethoven's *Sonata in A, op.* 47, for piano and violin, is commonly known. It was first played by Beethoven and Bridgetower the violinist (known as the Abyssinian Prince) in a suburb of Vienna in May, 1803. The movements are an introductory adagio sostenuto, leading to a presto; an andante con variazioni; and the finale presto. The sonata derives its name from its dedication to Rudolphe Kreutzer (1766–1831), the violinist and composer. This sonata is considered representative of Beethoven's chamber compositions.

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